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# USSR Report

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BIOMEDICAL AND BEHAVIORAL SCIENCES

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POSSIBLE USE OF PLASMIDS FOR STUDY OF EFFECT OF SPACE FLIGHT FACTORS ON  
BIOLOGICAL OBJECTS

Moscow ANTIBIOTIKI I MEDITSINSKAYA BIOTEKHNOLOGIYA in Russian No 5, May 86  
(manuscript received 6 Dec 84) pp 357-362

[Article by S. N. Zaloguyev (deceased), A. F. Moroz, L. I. Glatman, A. A. Terekhov, N. G. Antsiferova, V. L. Popov, F. M. Kirillova, L. N. Kats, M. P. Bragina, V. M. Shilov (deceased), T. Yu. Norkina, N. A. Polikarpov, V. K. Ilin, R. Tixador, G. Richoillet, G. Gasset, N. Moatti, and L. Lapshina, Institute of Biomedical Problems, USSR Ministry of Health; Scientific-Research Institute of Epidemiology and Microbiology imeni N. F. Gamalei; Groupe de Recherches Biologiques Spatiales, Toulouse; Faculté de Médecine, Université Paul Sabatier, Toulouse]

[Text] The problem of bacterial resistance to antibiotics has been a topic of increasingly greater attention among researchers and clinicians in their work on the prevention and treatment of possible infectious diseases induced by assumed pathogenic human microflora in space flight. Interest in these investigations has been particularly stimulated by a study of bacteria which indicated that the principal representatives of the automicroflora exhibited a higher level of resistance to antibiotics during the post-flight period [7].

It has been now proven that, as a rule, R-plasmids determine the polyresistance of assumed pathogenic bacterial strains. This, in turn, necessitates a search for specific approaches to the study of this problem, particularly in the selection of methods and objects of examination.

Interest in genetic studies in space arose long before such research was possible. A number of biological objects, such as yeast cells, lower fungi, phages, viruses, and certain bacteria, have already been tested. The basic conclusion to come out of these studies was that space flight factors, particularly weightlessness, do not cause any significant changes in growth processes, development, cellular and nuclear division, spontaneous and induced mutagenesis, recombination or reparation [1, 8, 12, 17]. However, contrary results were obtained, particularly in experiments on Tradescantia, Drosophila, and prokaryotes [4, 5, 19]. This inconsistency is quite legitimate for a problem in its early study stage, and is indicative of the need to continue such studies through the use of new objects and methodological approaches.

In our view, bacterial plasmids would make a convenient model for studying the effect that space flight factors have on the genetic apparatus of microorganisms. As is known, bacterial plasmids constitute a heterogeneous group of extrachromosomal elements that play an important role in resistance to antibiotics, pathogenicity, and bacterial metabolism. Plasmid metabolism was also found to be possible in the microflora of cosmonauts [2, 16].

We believe that the following properties of plasmids make them interesting objects for this kind of study:

- the presence of characteristic markers and the stable molecular-genetic parameters of plasmids that are easily controlled by modern physico-chemical methods make it possible to identify their presence in a cell and detect any structural and property changes;
- the diversity of features coded by the plasmids, the broad spectrum of microbial hosts, the capability of transferring to bacteria of other species and families make it possible both to increase the number of their examined features and combinations and the range of the microorganisms tested. Moreover, the advances made in genetic engineering technology makes the inherent cosmopolitanism of plasmids practically limitless;
- the DNA of certain plasmids are more sensitive to specific chemical compounds than are chromosomal DNA, and it is this property that underlies the search for agents to be used for the so-called chemotherapy of plasmids [15];
- there are recognized plasmids which change a host cell's sensitivity threshold to chemical and physical agents that are injurious to DNA (UV-radiation, mutagens). For example, the ability of plasmid pKM101 to elevate spontaneous and induced mutagenesis has been used in the bacterial testing of carcinogenic agents [18];
- plasmids may also be used for labeling strains.

The aforementioned considerations served as our incentive to undertake the present study which was a part of the joint Soviet-French Cytos-2 experiment conducted aboard the orbital station Salyut-7 (July 1982).

The purpose of the present work was to study the effect that space flight factors have on the phenotype and certain molecular-genetic plasmid parameters in *E. coli* strains whose growth and reproduction occurred in the course of a flight's orbital phase. Plasmids were selected so that there would be representatives of various classes of plasmids (R, Col, Hd1, and others) that differed in molecular weight, degree of conjugation, and origin.

## Material and Methods

### 1. Strains and Plasmids

Labeled *E. coli* strains containing the following plasmids were utilized:

*E. coli* J 5-3/Rldrd, auxotrophic for methionine and proline. Plasmid Rldrd (FII incompatibility group) controls resistance to streptomycin (Sm), ampicillin (Ar), kanamycin (Km), chloramphenicol (Cm), and sulfanilamides (Su) (strain obtained from E. Meynell, England).

*E. coli* 212/Hly. Plasmid Hly determines hemolysin production (collection of the Scientific-Research Institute of Epidemiology and Microbiology imeni N. G. Gamaleya, USSR Academy of Medical Sciences).

*E. coli* J 62/pLG74. Histidine, auxotrophic for histidine, tryptophan, and proline, possesses chromosomal resistance to streptomycin and nalidixic acid. Does not ferment lactose. Carries six plasmids with known molecular weights, including R-plasmid pL74 which codes resistance to kanamycin (incompatibility group I), plasmids that determine the production of colicin and EcoRV restriction endonuclease respectively, and three critical plasmids.

*E. coli* JC5183/pLG13. Plasmid pLG13 controls the production of EcoRV restriction endonuclease (the two latter strains were obtained from the Laboratory for Burn Infections at the Scientific-Research Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, USSR Academy of Medical Sciences) [3, 10].

### 2. Conditions for Strain Cultivation in the Cytos-2 Experiment

Bacterial suspensions in an isotonic sodium chloride solution were used as the inoculants. These suspensions were placed into small glass ampules which were contained in plastic sacks (sachets) filled with 1.2 ml of an API = 10M medium. At a specified time the ampules were crushed by a special mechanism actuated by cosmonaut G. L. (Cretien) as a result of which the ampule's contents passed into the medium. The final concentration of the cells following this inoculation was  $2.5 \times 10^5$ /ml. The cultivation temperature was maintained at 37°C for 24 hours, and then reduced to 4°C.

An identical synchronized experiment was simultaneously conducted on land-based Cytos equipment.

The API -- 10M medium included (in g/l):  $(\text{NH}_4)_2\text{SO}_4$  -- 2,  $\text{KH}_2\text{PO}_4$  -- 0.117,  $\text{Na}_2\text{HPO}_4$  -- 3.27, yeast extract -- 0.5, glucose -- 5, phenol red -- 0.170.

**Conjugation.** Conjugative hybridization was accomplished by the generally employed Watanabe method [20]. The frequency of plasmid transfer was determined by the ratio of transconjugants to the recipient cells.

**Colicin production** was determined by the Fredericq method [14]; phage  $\lambda$ -vir inoculation effectiveness was determined as the ratio of phage titers produced on a strain containing a plasmid, and on its non-plasmid version [11].

**Sensitivity to antibiotics** was established by the usual method of series dilutions.

**Separation of the plasmid DNA** was accomplished by the Birnboim and colleagues method [13].

**Table 1. Comparative Characteristics of E. Coli Strains Carrying Various Plasmids, From the Flight and Synchronized Land-Based Experiments**

№ бер- линго	Штамм E. coli	Вариант экспе- римента	Число клеток в 1 мл	lac-Приз- знак	Маркеры ауксотроф- ности	Маркеры ре- зистентности к антибиотикам	
						Хромо- сомные	Плазмидные
2	J 5-3/R1drd	Полетный <sup>(10)</sup>	1,8·10 <sup>8</sup>	+	met pro	—	Sm Cm Km Ap
104	J 5-3/R1drd	Синхронный <sup>(11)</sup>	3,4·10 <sup>7</sup>	+	met pro	—	Sm Cm Km Ap
4	212/Hly	Полетный <sup>(10)</sup>	3·10 <sup>7</sup>	—	—	—	—
104	212/Hly	Синхронный <sup>(11)</sup>	1,5·10 <sup>7</sup>	—	—	—	—
6	J62/pLG74	Полетный <sup>(10)</sup>	7,7·10 <sup>7</sup>	—	his trp pro	Sm Nal	Km
106	J62/pLG74	Синхронный <sup>(11)</sup>	1,7·10 <sup>8</sup>	—	his trp pro	Sm Nal	Km
10	JC5183/pLG13	Полетный <sup>(10)</sup>	1,9·10 <sup>8</sup>	—	—	—	—
110	JC5183/pLG13	Синхронный <sup>(11)</sup>	3,3·10 <sup>7</sup>	+	—	—	—

**Note:** Met — methionine; pro — proline; his — histidine; trp — tryptophan; Sm — streptomycin; Nal — nalidixic acid; Cm — chloramphenicol; Km — kanamycin; Ar — ampicillin

**Key:**

1. Sachet number
2. E. coli strain
3. Experimental version
4. Number of cells per 1 ml
5. lac sign
6. Auxotrophic markers
7. Antibiotic resistance markers
8. Chromosomal
9. Plasmid
10. Flight
11. Synchronized

## Results and Discussion

A comparative study was made of each strain under examination under three different experimental conditions, i.e., in space flight, synchronized land-based test, and a study of a control strain preserved in a semi-liquid agar at 4°C throughout the entire experiment. Also verified was the stability of property control by both plasmid and chromosomal genes.

The culture inoculations from the sachets of the sixth cartridge (Nos 2, 4, 6, and 10 from the flight experiment, and Nos 102, 104, 106, and 110 from the land-based synchronous experiment) were initially made on blood agar and a (MacConkie) medium by means of successive 10-fold dilutions of the sachet contents in an isotonic sodium chloride solution. This enabled us to determine the number of viable cells and select four columns from each culture for future experimentation. The cited data indicate that the number of viable bacteria ranged from  $1 \times 10^7$  to  $1.9 \times 10^8$  cells/ml both in the flight and synchronized experiments. The ability of the tested strains to ferment lactose did not change. Methionine and proline auxotrophic markers were retained in E. coli strain J 5-3, and histidine, tryptophan, and proline auxotrophic markers were retained in E. coli J62. There were also no identified changes in the antibiotic resistance structure of all the examined clones of E. coli J 5-3 R/lrd and E. coli J62/pLG74 both in the case of the plasmid as well as chromosomal markers (see Table 1).

Similar data were obtained in a comparison of colicin EI production in E. coli strains J62/pLG74, and hemolysin production in E. coli 212. The diameter of the lysis zone was 15 -- 17 mm for colicin EI in the strain clones in the flight, synchronous, and control experiments. All of the colonies cultivated in the first inoculation on blood agar yielded a hemolysis zone.

The data obtained in the determination of the conjugative transferability of transmissible R and Hly plasmids are presented in Table 2. The cited results indicate that the plasmids in the tested clones retained marker conjugation and the frequency of their transfer.

EcoRV restriction system function was determined by the effectiveness of the phage  $\lambda$ ·vir inoculation. The data obtained in this series of experiments allow us to conclude that this system exhibits the same activity in all of the tested versions of E. coli strains J62/pLG74 and JC 5183/pLG 13 (see Table 3).

The absence of any changes in the properties of the plasmid-coded strains and the strains of the flight experiment agrees well with the results of a study of the plasmid composition of strains that were obtained in an electrophoretic analysis of plasmid DNA. A comparison of the electrophoregrams shown in the diagram convincingly demonstrates the complete likeness of the plasmid profiles of flight and synchronous experimental strains that carry the same number of plasmids with unchanged molecular weights.

Table 2. Frequency of Conjugative Transfer of R- and Hly-Plasmids in Strains from the Flight and Synchronous Land-Based Experiments

1 Штамм E coli.	2 Плазмида	3 Селективные маркеры	4 Штамм-реципиент E. coli	5 Вариант эксперимента	6 Частота передачи в расчете на клетку реципиента
J 5-3	R1drd	Cm Km	J62 Nal	Полетный ⑧	1,3·10 <sup>-2</sup>
				Синхронный ⑨	4,5·10 <sup>-2</sup>
				Контроль ⑩	3,4·10 <sup>-2</sup>
J62/pLG74	R	Km	J5-3 Rf	Полетный ⑧	2,1·10 <sup>-2</sup>
				Синхронный ⑨	3·10 <sup>-2</sup>
				Контроль ⑩	4·1·10 <sup>-4</sup>
212	Hly	Способность к гемолизу ⑦	J62 Nal	Полетный ⑧	2,1·10 <sup>-3</sup>
				Синхронный ⑨	1,6·10 <sup>-4</sup>
				Контроль ⑩	1,1·10 <sup>-3</sup>
				Полетный ⑧	6,9·10 <sup>-4</sup>
				Синхронный ⑨	3,2·10 <sup>-3</sup>
				Контроль ⑩	1,3·10 <sup>-3</sup>

Key:

1. E. coli strain
2. Plasmid
3. Selective markers
4. E. coli recipient strain
5. Experiment version
6. Transfer frequency per recipient cell
7. Hemolysis capability
8. Flight
9. Synchronous
10. Control

Thus, the obtained data indicate that the space flight factors active under the conditions of the described experiment for a period of 24 hours did not have any effect on the examined properties of the tested strains and the plasmids contained in them.

This conclusion is in agreement with the results of most genetic investigations that were conducted earlier in a number of microorganisms in which all the fundamental biological processes in the prokaryote organisms were shown to proceed normally under conditions of weightlessness [1, 8, 12, 17].

One should note that the plasmids in the aforementioned investigations were used in two studies only. N. N. Zhukov-Verezhnikov and colleagues demonstrated that space flight factors do affect the frequency of F-factor transfer from the integrated to autonomous state in the Hfr strain, and the production of colicin [6]. In a later work, G. P. Parfenov and A. A. Lukin demonstrate to the contrary, that under space flight conditions the F-factor retains its integrated state and maintains the strain's donor competence [9].

Table 3. Effectiveness of Phage  $\lambda$ -Vir Inoculation on E. Coli Strains Possessing a E coR V Restriction -- Modification System

(1) Штамм E. coli	(2) Вариант эксперимента	(3) Титр фага $\lambda$ -vir	Эффективность (4) высева
JC5183		$9,1 \cdot 10^8$	1
JC5183/pLG13	Полетный (5)	$1,9 \cdot 10^5$	$2,1 \cdot 10^{-5}$
		$3,8 \cdot 10^5$	$4,2 \cdot 10^{-5}$
	Синхронный (6)	$1,9 \cdot 10^5$	$2,1 \cdot 10^{-5}$
J62/pLG74	Контроль (7)	$2,5 \cdot 10^5$	$2,8 \cdot 10^{-5}$
	Полетный (5)	$4,2 \cdot 10^5$	$4,6 \cdot 10^{-5}$
		$1,5 \cdot 10^6$	$1,3 \cdot 10^{-5}$
J62		$1,0 \cdot 10^5$	$9,3 \cdot 10^{-6}$
	Синхронный (6)	$7,9 \cdot 10^5$	$6,5 \cdot 10^{-6}$
	Контроль (7)	$1,2 \cdot 10^6$	$1,0 \cdot 10^{-5}$
		$2,4 \cdot 10^6$	$2,0 \cdot 10^{-5}$
		$1,2 \cdot 10^{10}$	1

Key:

1. Strain of E. coli
2. Experimental version
3. Titer of  $\lambda$ -vir phage
4. Inoculation effectiveness
5. Flight
6. Synchronous
7. Control

In spite of the preliminary and negative nature of the results we obtained in the present work, we believe that it is expedient to include the plasmids into the types of experiments we discussed in the introduction.

It would be interesting, for example, to expand the scope of the employed plasmids so as to include those which alter the sensitivity of the host cell to physical and chemical agents injurious to DNA (particularly, those that increase strain mutability). It would also be of interest to lengthen the impact time of space flight factors as well as subject the tested plasmids to repeated exposure.

The authors express their profound gratitude to the French cosmonaut G. L. (Cretien) as well as to the French specialists V. (Eche) and G. (Fappé) for their assistance in the conduct of the present study.

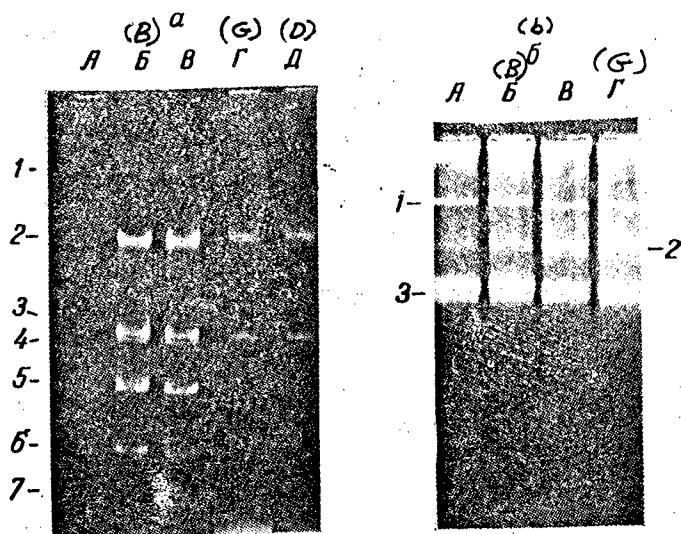


Diagram 1. Electrophoregrams of Plasmid DNA Preparations Isolated from Strains in Flight and Land-Based Synchronous Experiments.

a - E. coli J62/pLG74; A - flight, B - synchronous; E. coli JC5183/pLG13: B - flight, G - synchronous. 1A, 1B - R plasmid pLG74 (60.9 ppm); 2A - 2D - chromosome fragments, 3A - 3D - Col plasmid (4.7 ppm);, 4A, 4B - pLG13 (4.2 ppm); 5A; 5B - 2.8 ppm; 6A, 6B - 1.5 ppm 7A, 7B - 1.1 ppm.

b - E. coli 212 Hly: A - flight, B - synchronous; E. coli J5 - 3/R1drd: B - flight, G - synchronous. 1A, 1B - Hly plasmids (72 ppm); 2C, 2D - R1drs plasmid (62 ppm); 3A - 3D - chromosome fragments.

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6289

CSO: 1840/1291

## ZERO GRAVITY AND LIVING ORGANISM

Moscow TASS in English, 31 Jul 86

[Text] Soviet biologists have proved that zero gravity also influences such a basic biological process as mitosis, division of cells.

The authors of this discovery have established that zero gravity can cause structural changes in cells. They detected such changes for the first time in tissues of tradescantia during the plant's lengthy stay on a space flight. Such changes had not been registered on earth even when tissues were subjected to radiation, vibration or fluctuations in temperature. The results of the experiments were confirmed by numerous experiments on other experimental specimens.

Zero gravity has an unfavorable effect not only on mitosis. It causes unpleasant blood surges to the head in cosmonauts and changes in the state of the cardiovascular system and metabolism. Soviet scientists have developed preventive measures against the unfavorable influence of zero gravity on living organisms. As a result, periods of man's stay in space have increased.

/12955  
CSO: 1840/1306-E

AGROTECHNOLOGY

SHORTFALL ANTICIPATED IN UZBEKISTAN FODDER HARVESTS

Moscow DOMESTIC SERVICE in Russian 051700

[Summary in English of Moscow news release; date, not given, is probably 1986]

[Text] A correspondent reports on the progress of fodder procurement in the Uzbek SSR. First of all he dwells on the situation in Saryassiyskiy rayon, in Surkhandarya Oblast, where the quality and yield of fodder is good. "As a whole throughout the republic the state of fodder production is giving rise to serious alarm." Weather conditions had an effect primarily, with lack of rainfall leading to poor growth on natural meadows. The main gamble is therefore being made on irrigated land but the problem, the correspondent points out, is that not all farm managers have realized the seriousness of the situation. Although July is already here, many farms have still not finished the second cutting of alfalfa. He cites the example of neighboring rayons in one oblast, where one has completed the second cutting and the other has not: this is the case in other oblasts too. Uzbek farmers have a target of almost 5,500,000 t of coarse fodder which has to be procured to satisfy the needs of livestock. The correspondent concludes by saying "for these plans to become a reality it is necessary to change the attitude to hay-making radically and this especially concerns the managers of farms in Karakalpak ASSR, Navoi, Khorezm and Bukhara oblasts where the plan for fodder procurement has been fulfilled by less than one third."

/12955

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BRIEFS

NEW WHEAT LINE--Breeders in the Volga Area have adopted accelerated methods of development of new varieties and hybrids of spring wheat. For work under new conditions scientists have at their disposal modern instruments, equipment, and computers. Three harvests are annually gathered in the phytotron's artificial climate chambers. A new line of the well-known saratovskaya 42 wheat is now being prepared for transfer for industrial tests. [Text] [Moscow SELSKAYA ZHIZN in Russian 11 Jul 86 p 3] 11439/12955

CSO: 1840/1257

BIOCHEMISTRY

UDC 612.12+612.111.1+612.112.1]-053.2

CALCULATION METHODS FOR DETERMINING SOME BIOCHEMICAL PARAMETERS IN BLOOD PLASMA AND CELLS

Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 85  
(manuscript received 19 Feb 85) pp 35-36

[Article by R. V. Medkuryeva and I. A. Buryakovskiy, Scientific Research Institute of General and Communal Hygiene imeni A. N. Sysin, USSR Academy of Medical Sciences, Moscow]

[Abstract] Biochemical studies of blood plasma, urine and saliva were performed on 40 healthy children 7 to 8 years of age from an urban environment. The closest multiple correlation connections were established between blood plasma acetyl esterase activity and the other parameters tested, and between urine keratin sulfate level, malate dehydrogenase activity in the blood plasma, quantity of urine hexuronic acids, blood plasma, glycoprotein hexose, blood plasma lactate dehydrogenase activity and the remaining biochemical indices. Multiple linear regression was used to derive equations for computation of neutrophil myeloperoxidase acetyl esterase activity and glycoprotein hexose level in the blood plasma among the children studied based on the results of 11 other reactions. The calculated quantities were found to be close to the actual quantities determined in laboratory tests. The use of these equations can thus reduce the time and cost of biochemical studies by eliminating several tests. References 7 (Russian).

6508/12955  
CSO: 1840/2184

UDC 577.158.54:577.352.335

FIREFLY LUCIFERASE: LIPOPROTEIN COMPLEX

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 289, No 1, Jul 86  
(manuscript received 24 Jan 86) pp 231-233

[Article by A. F. Dukhovich, N. N. Ugarova and I. V. Berezin, corresponding member, USSR Academy of Sciences, Moscow State University imeni M. V. Lomonosov]

[Abstract] TLC and electrophoretic analyses were carried out on luciferase samples extracted from fireflies to explain loss of enzyme activity following exposure to surfactants or low ionic strength solutions. The resultant data indicated that luciferase is represented by a lipoprotein complex containing phospholipids and neutral lipids. One mole of purified luciferase was ascertained to contain 12 moles of phospholipids and 80 moles of neutral lipids. Studies on inactivation of luciferase by deoxycholate revealed an S-shaped curve with a Hill constant of 11, indicating that number of binding sites on the luciferase molecule for deoxycholate. Addition of lecithin or cardiolipin to deoxycholate-inactivated luciferase resulted in 20-90% recovery of activity, depending on the degree of inactivation. These observations provide the first direct proof for the lipoprotein nature of luciferase, as well as of the importance of the lipid component for enzymatic activity. Figures 3; references 9: 5 Russian, 4 Western.

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CSO: 1840/006

UDC 577.15.152

NEW APPROACH TO ENZYME STABILIZATION BY HYDROPHILIZATION OF APOLAR SURFACE MOIETIES: CHEMICAL MODIFICATION OF TYROSINE RESIDUES IN TRYPSIN

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 288, No 4, Jun 86  
(manuscript received 16 Dec 85) pp 1006-1009

[Article by V. V. Mozhayev, N. S. Melik-Nubarov, K. Martinek and I. V. Berezin, corresponding member, USSR Academy of Sciences, Moscow State University imeni M. V. Lomonosov]

[Abstract] Since the presence of hydrophilic surface moieties has been demonstrated to enhance stabilization of protein molecules, chemical modification of bovine trypsin was undertaken to determine whether such a chemical change would increase its thermal stability. Specifically, the four exposed tyrosine residues on the trypsin molecule were subjected to addition of amino groups by nitration with tetranitromethane, followed by reduction with sodium dithionite. Resultant heat denaturation data showed that amination of the tyrosine residues, which rendered them hydrophilic, increased thermal stability of the trypsin molecules more than 100-fold in comparison with the native enzyme. The increased heat stability was ascribed to retention of the modified tyrosine residues on the surface of the trypsin molecule, rather than sequestration within the globule which occurs when the native enzyme is heated. Figures 2; references 15: 2 Russian, 13 Western.

12172/12955  
CSO: 1840/003

UDC 546.215:611-018.74.54

PROTECTION OF ENDOTHELIAL CELLS BY IMMUNOERYTHROCYTES FROM CYTOTOXIC EFFECTS  
OF HYDROGEN PEROXIDE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 288, No 3, May 86  
(manuscript received 29 Dec 85) pp 748-751

[Article by V. R. Muzykantov, D. V. Sakharov, S. P. Domogatskiy, N. V. Goncharov, S. M. Danilov and V. N. Smirnov, corresponding member, USSR Academy of Sciences, Institute of Experimental Cardiology of the All-Union Scientific Cardiological Center, USSR Academy of Medical Sciences, Moscow]

[Abstract] In vitro studies were conducted on the protection of endothelial cells from hydrogen peroxide, such as may be released by activated phagocytes, by an erythrocyte barrier. Specifically, monolayers of endothelial cells derived from human umbilical vein were exposed to mouse anti-human endothelium antiserum, and subsequently treated with immunoerythrocytes, i.e., erythrocytes on which antibodies against mouse IgG were immobilized. Trypan blue exclusion studies demonstrated that endothelial cell monolayers treated with the immunoerythrocytes were protected from the cytotoxic effects of added hydrogen peroxide. These observations suggest that immunoerythrocytes may render local protection of the endothelial wall in an inflammatory focus in therapeutic trials, and support the need for more detailed studies on the antigenic characteristics of endothelial cells. Figures 3; references 13 (Western).

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CSO: 1840/001

UDC 577.334

DETECTION AND IDENTIFICATION OF SHORT-LIVED AMINE FREE-RADICALS BY SPIN TRAPS  
DURING METABOLISM OF SOME LIVER MICROSOMES N-NITROSO-COMPOUNDS

Moscow DOKLADY AKADEMII NAUK in Russian Vol 286, No 5, Feb 86  
(manuscript received 30 Jan 85) pp 1182-1186

[Article by A. N. Saprin, Yu. N. Dubrov and R. A. Kiknarevich, Scientific Research Institute for Biological Testing of Chemical Compounds, Kupavna, Moscow Oblast]

[Abstract] Free-radical metabolites (short-lived amine radicals) forming in rabbit liver microsomes *in vitro* during biotransformation of 3 representatives of carcinogenic N-nitroso-compounds (NS) (nitrosomethylurea (NMM), 1-(2-chloroethyl)-3-cyclohexyl-1-nitrosourea (KhTsNM) and N-methyl-N-nitro-N-nitrosoguanidine (MNNG) were detected and identified by the method of spin traps in order to study pathways of NS in the organism. Chemically active short-lived amine type free-radicals formed in the process of NS metabolism. It was assumed that one of the mechanisms of biotransformation of NS in rabbit liver microsomes involves formation of unstable  $R_1-N-R_2$  radicals. Use of a phenyltertiary-butylnitrone spin trap revealed, for all of the NS studied, the spin trap spectrum from a nitrogen atom in the gamma position in molecules of the corresponding spin adducts and, in the case of NMM, spectra from 3 equivalent protons in the delta position, which confirmed identification of the observed metabolites. Figures 3; references 11 (Western).

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UDC 577.34

MODIFYING EFFECT OF ANTI-OXIDANTS ON BIOTRANSFORMATION OF DIALKYL NITROSO AMINES STUDY BY SPIN TRAP METHOD

Moscow DOKLADY AKADEMII NAUK in Russian Vol 286, No 5, Feb 86  
(manuscript received 17 Apr 85) pp 1264-1268

[Article by V. Yu. Pakhomov, T. S. Shulyakovskaya, L. G. Artemova and A. N. Saprin, Scientific Research Institute for Biological Tests of Chemical Compounds, Staraya Kupavna, Moscow Oblast]

[Abstract] Intact male Wistar rats and those predosed for 3 days with the substances studied, via a stomach probe, were used to study the free-radical mechanism of transformation, in liver microsomes, of the carcinogens dimethyl-dinitrosoamine [DMNA] and diethyl-dinitrosoamine [DENA], their non-carcinogenic precursors dimethylamine [DMA] and diethylamine [DEA] and the carcinogen dimethylnitramine [DMiA], by the spin traps method. The effect on generation of OH<sup>-</sup>-radicals and radicals from DMNA and DENA carcinogens in liver microsomes of some substances producing a protective effect and some substances not doing so, after intoxication of animals by DENA. Spin adducts, free radicals, forming as a result of metabolic transformation in the microsomal enzymic system of the carcinogen, their chemical precursors and DMNA have different chemical structures. Experiments "in vitro" suggested that the mechanism of protective effect of the antioxidants may be connected directly with their anti-radical properties. Reduction of free-radical generation in microsomes from carcinogens was attributed to the fact that butylhydroxytoluene (BGT) changes, significantly, DENA metabolism in the microsomes and increases its inactivation. The substances which intensify the toxic effect of DENA intensify free-radicals generation from the carcinogens in the microsomes. The toxic effect was caused by an increase of the number of free radicals forming as a result of enzymic dealkylation of DENA. The protective effect of BGT was associated with its anti-radical action and with inhibition of dealkylation of the carcinogen in the microsomal enzymic system of the liver. Figures 2; references 12: 4 Russian, 8 Western.

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CSO: 1840/1202

UDC 577.3

STUDY OF TIROLIBERIN RECEPTION IN SUSLIK (CITELLUS UNDULATUS) BRAIN DURING  
WINTER SLEEP

Moscow DOKLADY AKADEMII NAUK in Russian Vol 286, No 5, Feb 86  
(manuscript received 9 Oct 85) pp 1268-1271

[Article by K. N. Yarugin, L. I. Kramarova, G. R. Ivanitskiy, corresponding member USSR Academy of Medical Sciences and S. G. Kolayeva, Institute of Biological Physics, USSR Academy of Sciences, Pushchino, Moscow Oblast; Institute of Cardiology, All-Union Cardiological Scientific Center, USSR Academy of Medical Sciences, Moscow]

[Abstract] Investigation of the state of receptors in suslik (*C. undulatus*) hippocampus and hypothalamus during deep winter sleep of the animal and on the first day of brief awakenings involved a study of H-tiroliberin [TRG] bonding with membranes isolated from the hippocampus. The TRG-TRG receptor system participates in regulation of activity of winter-sleeping susliks during periodic awakenings by an unknown mechanism. It was suggested that one of the pathways of regulation of arousal from torpor may be a change of concentration of TRG receptors in the central nervous system which involves changes of sensitivity of brain structures to this peptide. The TRG-hippocampus thermoregulator mechanism, evidently, ensures a sufficiently high body temperature of the suslik. Figures 2; references 13: 1 Russian, 12 Western.

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CSO: 1840/1202

UDC 578.835.15:578.56

POSSIBLE MECHANISM OF RECOMBINATION BETWEEN RNA-GENOMES

Moscow DOKLADY AKADEMII NAUK in Russian Vol 286, No 5, Feb 86  
(manuscript received 4 Nov 85) pp 1272-1275

[Article by V. M. Blinov, L. I. Romanova, Ye. A. Tolskaya, Ye. G. Viktorova, M. S. Kolesnikova, Ye. A. Guseva and V. I. Agol, All-Union Scientific Research Institute of Molecular Biology, Novosibirsk; Institute of Poliomyelitis and Virus Encephalites, USSR Academy of Medical Sciences, Moscow]

[Abstract] A study of the primary structure of the region of genetic crossing in genomes of poliomyelitis virus recombinants provided data for 2 new recombinants and revealed some common traits in primary structure of regions of crossing which permitted formulation of a model of recombination between RNA-genomes of the picoviruses. A model of recombination between the RNA-genomes was illustrated and some specific features of it are described and discussed. The most significant feature of the model reveals the existence in the virus genome of places which are most favorable for recombination. There are many such places, distributed throughout the entire poliomyelitis virus RNA molecule. Figures 3; references 15: 3 Russian, 12 Western.

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UDC 612.251+612.12.2.+616.155.191

DISTURBANCE OF OXYGEN UTILIZATION BY TISSUES DURING HEREDITARY ERYTHROCYTOSIS

Moscow DOKLADY AKADEMII NAUK in Russian Vol 286, No 5, Feb 86  
(manuscript received 31 Oct 85) pp 1276-1280

[Article by M. G. Dmitriyeva, L. O. Gazenko, L. A. Polyakova, N. K. Yefimova,  
B. V. Krekhnov and Yu. I. Tokarev, Scientific Research Institute of Hematology  
and Blood Transfusion, Moscow]

[Abstract] A study of oxygen balance combined with acid-base equilibrium of the blood, which revealed the oxygen supply to tissues and possible disturbances in it, included 22 persons (13 women and 9 men ranging in age from 13-46 years) without any diseases causing secondary erythrocytosis. Adequate oxygen supply to tissues in the hand-forearm in 50 percent of the subjects was provided exclusively by increased  $O_2$  extraction from the blood into the tissues. Disruption of this compensatory mechanism due to pronounced disturbances of the microcirculation in 36 percent of the subjects produced secondary tissue hypoxia accompanied by hyperoxia of the peripheral venous blood. Figure 1; references 8: 5 Russian, 3 Western.

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CSO: 1840/1202

UDC 577.3

MEMBRANE FUSION: LOCAL INTERACTIONS AND STRUCTURAL REARRANGEMENTS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 288, No 4, Jun 86  
(manuscript received 29 Dec 85) pp 1009-1013

[Article by L. V. Chernomordik, M. M. Kozlov, S. L. Leykin, V. S. Markin and Yu. A. Chizmadzhev, Institute of Electrochemistry imeni A. N. Frumkin, USSR Academy of Sciences, Moscow]

[Abstract] An analysis is presented of the steps involved in bilayer membrane fusion, particularly of the problem involving the repulsive forces that counteract membrane approximation. Mathematical evaluation of the various steps has demonstrated that, at a distance of 20-30 Å, the hydrational barrier is overcome by thermal fluctuations of the curvature, allowing local approximations on the order of 5 Å or less. As a result of competitive hydrational and hydrophobic forces, the structure of the monolayer sites in contact is disrupted, leading to stalk formation. Fusion requires that the external monolayer of each vesicle possess a negative spontaneous flexure while the internal monolayer a positive curvature. Such relationships favor widening of the stalk and the formation of a trilaminar structure. A subsequent stage involves the formation of a hydrophilic pore and mixing of the vesicular contents. Figures 2; references 13: 4 Russian, 9 Western.

12172/12955  
CSO: 1840/003

## BIOTECHNOLOGY

### PROSPECTS FOR BIOTECHNOLOGY AND GENETIC ENGINEERING

Moscow KRASNAYA ZVEZDA in Russian 5 Jul 86 p 4

[Article by K. Skryabin, professor, Moscow State University imeni M. V. Lomonosov, and chief, Laboratory of Genetic Engineering, Institute of Molecular Biology, USSR Academy of Sciences]

[Abstract] The 27th Party Congress has placed considerable emphasis on the importance of biotechnology and genetic engineering in Soviet economy. Advances in these two fields have become so intertwined that at present it is sometimes difficult to differentiate between them. Suffice it to say that developments in our understanding of DNA and its function have made it possible to modify bacterial, plant and microbial cells, and utilize them in the biotechnological sense of meeting human needs more efficiently than is possible by other means. At the present time biotechnology has already had an impact on medicine, providing substances that are in short supply, e.g., growth hormones, interleukin-2 and other valuable products. New varieties of frost-, pest- and disease-resistant crops have been derived, and large-scale tissue culture techniques in combination with genetic engineering have provided vaccines against malaria, hepatitis, and other diseases. These are just a few of the reasons that explain the great interest that the Party has shown in biology.

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CSO: 1840/1283

## BIOCOMPUTERS IN THE FUTURE?

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 10, 20 May-2 Jun 86  
pp 8-9

[Interview, conducted by A. Mikhaylov, with G. Ivanitskiy, corresponding member and director, Institute of Biophysics, USSR Academy of Sciences]

[Abstract] Bioengineering is a field of scientific endeavor and involves harnessing biological systems and substances to engineering processes, and it is expected to play a great role in the future. Such approaches rely on the efficiency of biological systems in the transformation of one form of energy to another, and the fact that these systems generally function on a micro-scale. Thus, for example, photographic films have been prepared from rhodopsin preparations, and the functional flexibilities of various proteins as electron transfer agents are being considered for design of computer microchips. Contractile biopolymers are already under consideration as possible energy sources for various types of micromachines, while a variety of other self-controlling biochemical and chemical oscillating systems may provide valuable feedback control mechanisms.

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CSO: 1840/1279

BIOTECHNOLOGY TODAY AND TOMORROW

Kishinev SOVETSKAYA MOLDAVIYA in Russian 3 Jul 86 p 4

[Interview with A. Bayev, academician, USSR Academy of Sciences]

[Abstract] Recent progress in genetic engineering has resulted in the production of insulin by bacteria, lowering the cost of insulin and making it more available. Other applications of biotechnology have provided microbiological methods for managing oil spills, using microbes for elimination of environmental pollutants via biodegradation of various products, and for supplementing feed and food supply through such developments as single-cell proteins. Manipulation of cells and other biological products had made it possible to create hybrid cells from unrelated species, such as tobacco and soybean, and to regenerate an entire plant from one cell. In addition, such techniques have resulted in the creation of new varieties of crops in three to four years, whereas the previous time scale for a new variety was 12 years or more. In Krasnodar, rice varieties have been obtained that now have yields of 100 centners/hectare. Other new varieties include Aurora wheat and Vesna potatoes. Further progress in biotechnology has virtually no limit, except that imposed by lack of imagination.

12172/12955  
CSO: 1840/1267

UDC 579.852.11:579.222

MEMBRANE-RETENTION OF INTERFERON SECRETED BY BACILLUS SUBTILIS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 288, No 3, May 86  
(manuscript received 4 Mar 86) pp 717-720

[Article by A. S. Avakov, T. V. Chernovskaya, V. Ye. Bidnenko, Ye. G. Abalakina, Yu. V. Yomantas, A. V. Sorokin, M. R. Yeremashvili, A. Ya. Strongin, A. K. Sokolov, Yu. I. Kozlov, A. I. Stepanov and V. G. Debabov, All-Union Scientific Research Institute of Genetics and Breeding of Industrial Microorganisms, Moscow]

[Abstract] An analysis was conducted of a system based on *B. subtilis* AJ73 for the production of human leukocyte interferon (HLI), in order to provide comparative data for systems other than those based on *E. coli*. The *B. subtilis* cells were transformed with hybrid plasmid pTGA6, containing the interferon gene and *B. amyloliquefaciens* alpha-amylase gene. Data on HLI secretion demonstrated that, in addition to secretion, a considerable portion of HLI activity was retained in a membrane-bound form. The latter HLI was released only after treatment of the cells with sodium dodecylsulfate, but not by ultrasonication. In addition, the MW of the bound HLI was greater than that of the secreted fraction by a magnitude equivalent, more or less, to 31 amino acids. The latter observation suggested lack of processing of the bound interferon by proteases. Since the concentration of membrane-bound HLI was essentially equivalent to that secreted, the system appears suitable for studying the interrelationship between the bound and secretory forms of proteins in *B. subtilis*. Figures 3; references 15: 2 Russian, 13 Western.

12172/12955  
CSO: 1840/001

ENVIRONMENT

UDC 614.71:546.49]-073.75

FLUORESCENT X-RAY RADIOMETRIC DETERMINATION OF MERCURY IN AIR AND OTHER ENVIRONMENTAL OBJECTS

Moscow GIGIYENA I SANITARIYA in Russian No 12, Dec 85  
(manuscript received 27 Feb 85) pp 47-48

[Article by M. T. Dmitriyev and B. I. Fradkin, Scientific Research Institute of General and Communal Hygiene, imeni A. N. Sysin, USSR Academy of Medical Sciences, Moscow]

[Abstract] The authors have developed a fluorescent method for determination of mercury in the air and other environmental objects based on excitation of secondary characteristics upon irradiation of mercury atoms by means of the radioactive isotope  $^{238}\text{Pu}$  with subsequent measurement of the intensity of this radiation by semiconductor or scintillation detectors. The major advantages of fluorescent determination of mercury include high specificity and rapidity. Sensitivity of analysis is 0.05  $\mu\text{g}$ . With a specimen volume of 50-500 liters, the minimum concentration of mercury which can be determined in air is 0.0001-0.001 mg/m<sup>3</sup>. Accuracy of determination is 2 to 3%. The properties of the chemical compounds in which the mercury is found do not influence results of analysis. Other elements and toxic compounds do not hinder the determination of mercury, with the exception of lead and platinum, which slightly increase the minimum quantity which can be determined when their own content is  $10^4$ - $10^5$  times greater than the content of mercury.

References 11: 9 Russian, 2 Western.

6508/12955

CSO: 1840/2188

EPIDEMIOLOGY

UDC 613.6:614.881/.883

CONDITIONS OF LABOR AND MORBIDITY OF EMERGENCY MEDICAL PERSONNEL

Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 85  
(manuscript received 17 May 85) pp 21-23

[Article by V. A. Kaptsov, R. M. Kalitina, R. S. Trubnikova and V. M. Koptelov,  
Scientific Research Institute of Labor Hygiene and Occupational Diseases,  
USSR Academy of Medical Sciences, Moscow]

[Abstract] High morbidity and turnover of emergency medical personnel has stimulated a study of the occupational activity of this group to optimize labor conditions and prevent illness. Over 70% of the subjects studied were physicians younger than 40 years of age. Over half had less than 3 years of service, 35.5% less than one year. Much of the work must be performed in ambulances, where the temperature, noise and vibration levels cannot be considered satisfactory. Fatigue develops rapidly and severely during the course of a working shift under these conditions. Improvements in working conditions suggested include: creation of permanent teams to avoid shift work, increasing day-shift-length to 14 hours, while decreasing night shift to 10 hours, improvement of temperature and humidity in ambulances, periodic pauses for exercise and self-massage, provisions of rooms for mental and physical unwinding, improvement of dispensary observation of chronically ill physicians and relief of such personnel from duty as needed. References 5 (Russian).

6508/12955  
CSO: 1840/2184

UDC 616.98:579.842.1/.2]-022.35-07

MODELLING OF TRANSMISSION OF BACTERIAL INTESTINAL INFECTIONS DURING BATHING

Moscow GIGIYENA I SANITARIYA in Russian No. 12, Dec 85  
(manuscript received 31 Oct 84) pp 51-52

[Article by Yu. G. Talayeva, Ye. I. Kruglova and K. F. Birk, Scientific Research Institute of General and Communal Hygiene imeni A. N. Sysin, USSR Academy of Medical Sciences, Moscow; Scientific Research Institute of Epidemiology and Hygiene, ESSR Ministry of Health, Tallin]

[Abstract] A model is developed for the study of the infection of bathers with various levels of microbial contamination of water using the saprophytic strain of *E. coli* M17. Studies were performed in three pools containing non-chlorinated water. Bacteriologic investigations were performed on 320 children 4 to 7 years of age. The method suggested for the studies reduced analysis time, used less glassware and increased productivity. The results of the studies showed that when the content of the model microorganism was hundreds of thousands of cells per liter, the rate of infection of bathers was 76%. When the contaminating dose of the test microbe was reduced, the rate of infection also dropped. With tens of thousands of cells per liter, 61.9% of the subjects were infected after bathing, with thousands of colonies per liter, 56.3%, with hundreds--20%, with tens--11.8%, with individual cells--5.6%. References 5: 2 Russian, 3 Western.

6508/12955  
CSO: 1840/2188

## GENETICS

### MEASURING CHROMOSOMES

Leningrad TASS in Russian 9 Jul 86

[Text] Leningrad, 9th July /TASS/: An automatic device, the EKRAN [Screen], created by Soviet specialists, measures the infinitely small bodies of chromosomes on micro-photographs speedily and with a high degree of precision. This "ruler" for chromosomes ensures a sevenfold acceleration of labor-consuming statistical calculations in research by geneticists.

The device has been created at the Boris Konstantinov Nuclear Physics Institute in Leningrad. A special machine code and programs allowing the measuring device to be linked to a computer have also been developed. It is sufficient merely to "offer" the system a photograph with the image of the chromosomes and it will, by itself and without the researchers taking part, measure their length, classify them according to their external characteristics and report the results on a printout.

A study of 85 collections of human chromosomes showed a high degree of reliability and accuracy.

/12955

CSO: 1840/1303-E

UDC 577.113:633.15

MODULATION OF REPETITIVE GENES IN PARENTAL FORMS OF CORN HYBRIDS  
DEMONSTRATING HETEROSES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 289, No 1, Jul 86  
(manuscript received 17 Dec 85) pp 224-227

[Article by Sh. Ya. Gilyazetdinov, A. N. Zimnitskiy, I. A. Yakhin and E. Sh. Bikbayeva, Department of Biochemistry and Cytochemistry, Bashkir Branch, USSR Academy of Sciences, Ufa]

[Abstract] To further define the importance or role of the number of copies of a given gene in the parental forms in formulating hybrid vigor in the progeny, corn models were used to assess the situation with respect to moderately or rarely repetitive genes. The molecular hybridization studies were conducted on high [Slava (VIR 44 x VIR 38)], intermediate [Svetoch (VIR 40 x VIR 43)], and low [Iskra (VIR 26 x VIR 27)] heterosis hybrids, as well as their parental forms. Evaluation on the frequency data for genes coding for tRNA, 5S rRNA, 5S rRNA, histones, and controlling element Ds revealed considerable variation in the recurrence of the individual genes in the various corn lines. Differences in the genome structure of self-pollinating lines were evidently due to unequal crossover as well as amplification of certain sequence families at individual steps of plant embryogenesis. The data, on the whole, indicated that differences among the parental forms in terms of gene number for the rarely and infrequently repeated genes led to functional equilibrium in the genome of highly productive hybrids.

Figures 2; references 15: 2 Russian, 13 Western.

12172/12955  
CSO: 1840/006

UDC 581.33:537.531:575.13

USE OF  $\gamma$  IRRADIATED POLLEN IN GENE TRANSFER IN PETUNIAS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 288, No 5, Jun 86  
(manuscript received 6 Jan 86), pp 1233-1236

[Article by S. V. Andreychenko and D. M. Grodzinskiy, Institute of Plant Physiology, UkrSSR Academy of Sciences, Kiev]

[Abstract] Genetic transformation is a process in which pollen tube of  $\gamma$ -irradiated pollen is used to introduce specific genetic material into the genome of the ovum cell through pollination. Such genetic transformation was studied in petunia, an excellent genetic model with detailed mapping of phenotypic markers. It was discovered that pollen irradiation depressed the process of sperm formation expressed by the absence of generative cell division into sperms. The growth of pollen tube was drastically diminished. It was determined that appearance of the mentor effect, in the gametophytic system, of the incompatibility in petunias assured the formation of viable seeds and facilitated gene transfer by gametic transformation from irradiated mentor pollen to the genome of the ovum cell during the syngamy process. In this fashion, genes An4, S and even both, were transferred from the donor to the recipient. Gametic transformation assured integration and expression of genes as well as their passage to the daughter generations. Figure 1; references 12: 3 Russian, 9 Western.

7813/12955  
CSO: 1840/004

IMMUNOLOGY

QUALITY CONTROL OF VACCINES

Moscow MOSKOVSKAYA PRAVDA in Russian 1 Aug 86 p 3

[Interview, conducted by I. Krasnopol'skaya, with Tagir A. Bektimirov, doctor of medical sciences, director, Scientific Research Institute of Standardization and Control of Medical and Biological Preparations imeni L. A. Tarsevich]

[Abstract] The main criteria which the Institute employs in evaluating vaccines are safety and efficacy. Unfortunately, not all the vaccines produced by more than 30 establishments in the USSR meet the quality control standards. However, the quality control standards are being continuously refined and attuned to the latest vaccine technology in order to assure greater health benefits to Soviet citizens and a commercially competitive product abroad. With the development of biotechnology and genetic engineering, new standards will have to be established to assure full safety of vaccines and other products produced in this manner. This will entail familiarity with and control of this new technology on the part of the personnel through new educational programs, and expansion of existing facilities, laboratories, and equipment.

12172/12955  
CSO: 1840/1284

UDC 616-018:616-078

DYNAMICS OF NATURAL KILLER ACTIVITY DURING DEVELOPMENT OF B16 MELANOMA IN MICE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 288, No 5, Jun 86  
(manuscript received 20 Jan 86) pp 1267-1270

[Article by L. V. Kovalchuk, Ye. V. Sokolova, S. B. Cheknev and V. V. Deyev,  
Second Moscow State Medical Institute imeni N. I. Pirogov]

[Abstract] Activity of natural killer cells (NK) during the growth of B16 melanoma was studied in syngeneic system. A 100% take of the tumor assured growth rate, uniform life expectancy of the host and reproducibility of results in large groups of animals. Two peaks were noted while analyzing the dynamics of the NK activity during the growth of B16 melanoma on the 3rd and 17th days after tumor inoculation along with drastic drop of the lysis indices at the 7th and 20th days. This evidently relates to the immune system of these animals. NK cells evidently control tumor growth *in vivo*, but this control is not uniformly effective in all stages of the process. Present and literature data correctly question the aspect of altered activity of the NK cells in host animals with respect to their retardation of tumor growth by dissolved mediators or by cellular populations containing precursors of NK cells. Figures 2; references 13: 7 Russian, 6 Western.

7813/12955  
CSO: 1840/004

## LASER BIOEFFECTS

UDC 621.378.9:615.849.19

### OPTICAL PARAMETERS OF SKIN EXPOSED TO LASER RADIATION

Moscow BIOLOGICHESKIYE NAUKI in Russian No 10, Oct 84 pp 108-111

[Article by A. K. Polonskiy, A. A. Dreval, Yu. V. Golubenko, A. R. Yevstigneyev, A. V. Cherkasov, V. F. Barybin, V. B. Potapova and Ye. M. Andreyev: "Measuring the Optical Parameters of Human and Animal Tissue Exposed to a Laser"]

[Text] A new method for assessing the effect of low-intensity laser energy on biological tissue has been developed. This method makes it possible to determine the exposure more precisely in each specific case of laser irradiation.

When biological tissue is exposed to laser radiation, a quantitative assessment of the acting energy is necessary. Practically all researchers who studied this problem (1, 2, 4-7, 8-10, 12-16), as a rule, take into account only the basic parameters of the radiation falling on the object: the wavelength of the radiation, its power at the point of coming out of the device, the diameter of the beam and its distribution over the area of the object, the exposure time, and informational characteristics. Calculating the amount only of the laser radiation falling on the object, and not the effective radiation (that which penetrates into the tissue) substantially complicates the task of determining the degree of effectiveness of exposure to a laser on biological tissue, not only in each specific case but also in statistical processing of the results. This occurs because of the absence of an assessment of the portion of the energy falling on the object which is reflected from its surface. But determining this percentage of the energy by some sort of calculation method is complex, since the coefficient of reflection of living tissue varies within fairly wide limits.

We set ourselves the task of developing methods and equipment for measuring the effective dose of laser radiation, which could be used both in scientific experiments on animals and in medical practice.

In order to make a quantitative assessment of the laser radiation which has affected a biological object, it is necessary to measure the dose of radiation falling on the object according to the characteristics of the laser device and subtract from it the value of the dose reflected from the irradiated surface, depending on the optical properties of this surface. The primary reflection from the irradiated surface is rarely diffuse, therefore it is not always possible to use the Lambert rule (3, 17) for analysis. For a more precise

measurement of the reflected portion of the radiation, it is necessary to use integration over the entire surface of the front of reflected light. The measurement is carried out by photorecording the specific portion of the laser radiation which is scattered after integration. By comparing the value of the signal of the photodetector at the moment of irradiation of biological tissue with the value of the signal during calibration of the instrument, it is possible to calculate the absolute value of the coefficient of the reflection of the tissue at a given moment of time by the formula:

$$\rho_{tis} = \frac{\phi_{tis}}{\phi_{st}} \times \rho_{st},$$

where  $\phi_{tis}$  is the value of the flow of reflected radiation corresponding to the value of the signal of the photodetector at the moment of irradiation;  $\phi_{st}$  is the value of the flow of radiation reflected from the standard, corresponding to the value of the signal of the photodetector during calibration; and  $\rho_{st}$  is the coefficient of reflection of the standard used for calibration.

The power of the reflected flow of radiation ( $\phi_{ref}$ ) at a given moment of time is determined as the product of the value of the flow of radiation falling on the object and the coefficient of reflection of the biological tissue,  $\rho$ , while the value of the effective flow is determined by the formula:

$$\phi_{effect} = \phi_{fall} (1 - \rho_{tis}).$$

It makes sense to carry out optimization of the process of irradiation of the biological tissue by the formula:

$$t_{irrad} = K \times \frac{(1 - \rho_{av})}{(1 - \rho_{tis})} \times t_s,$$

where K is the coefficient, equal to 1 when the object is exposed to constant radiation; it can be changed when the radiation exposure is rescaled in experimental tasks, and it is then calculated according to a special formula;  $t_s$  is the time of radiation with an average constant coefficient of reflection  $\rho_{av}$  (table).

Table--Average Values of Coefficients of Reflection of Human Skin Exposed to Laser Radiation of Various Wavelengths  
(P < 0.05)

<u>Wavelength, micrometers</u>	Coefficient of Reflection	
	<u>Men</u>	<u>Women</u>
0.6328, polarized	0.36	0.41
0.6328, nonpolarized	0.34	0.35
0.8, 0.9	0.22	0.23
1.15	0.19	0.20

It is usually sufficient to take three to four measurements during a 3-5-minute procedure, in order to substantially reduce the time of exposure to the radiation. These results were also confirmed using a cybernetic system similar in type to the laser medical unit we developed (16).

In order to make it possible to carry out the procedure described above, we developed a device which could be added into the collection of laser units currently being produced for medical-biological research, including a laser unit operating on semiconductors (11). This device includes a laser source or radiating diode with instruments for measuring the parameters of the optics and of the energy reaching the object, and also an integrating chamber and a measurer of laser energy with diaphragms placed at the entrance and exit of the integrating chamber. A screen was placed inside the chamber which eliminates the direct entry of reflected radiation from the exit opening into the sensing field of the photodetector. The integration chamber is the body of the instrument and is made in the form of a sphere on whose internal surface and screen a white matte-finish covering is placed, with a diffuse coefficient of reflection of 65-99 percent on the wavelength of the laser radiation used. The photoelement is placed so that its sensing field coincides with the tangent plane to the surface of the sphere. When this is done, the point of tangency is on the radius of the sphere which is perpendicular to the diameter, passing through the center of the entrance and exit openings (diaphragms) and coinciding with the axis of the beam of laser radiation falling on the object. The signal is registered both visually and on a recording apparatus. The basic schematic of the device is presented in Fig. 1.

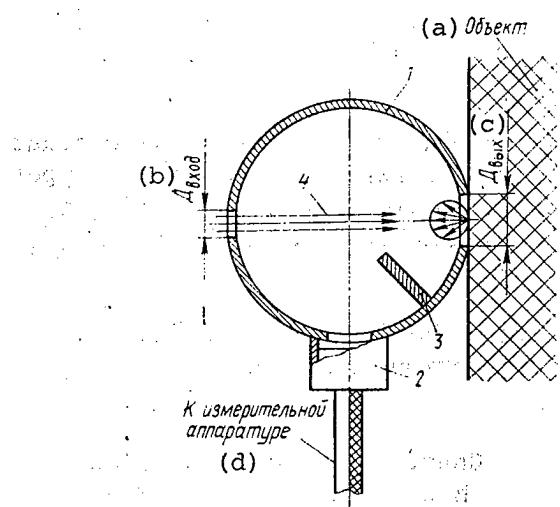


Fig. 1. Schematic of device for determining coefficients of reflection:  
1--integration sphere, 2--photodetector,  
3--screen, 4--radiation from the laser.  
Key: a--object; b--entrance diaphragm;  
c--exit diaphragm; d--to the measuring  
apparatus.

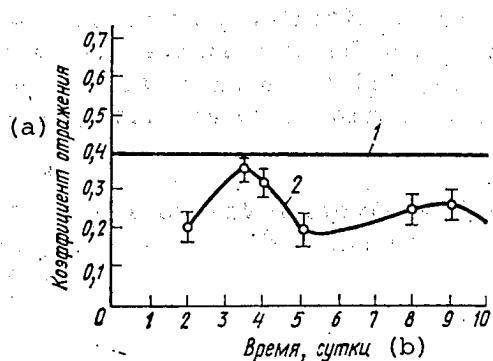


Fig. 2. Change in the coefficient of reflection of skin from the back of a white rat: 1--intact skin, 2--epithelization of a skin wound.  
Key: a--coefficient of reflection;  
b--time, days.

According to the methodology developed, and using the described equipment, more than 2,500 measurements were made on the skin of experimental animals (rats, rabbits, dogs), as well as human skin. As a result of the research it was established that the optical characteristics of various areas of skin differ substantially. The average values of the coefficient of reflection of human skin in the wavelength range of 0.6-1.4 micrometers (helium-neon and semiconductor lasers, light emitting diodes) are 18-30 percent. The coefficient of reflection on specific points of skin varies from 5-40 percent, which is connected with the individual characteristics of the body, daily and weekly rhythms, and the functional state of the body (for example, before or after eating).

A number of tasks were carried out to study skin's reflection of laser light under conditions of experimental pathology. For example, in the scarification of skin in rats, precise dynamics of changes in the coefficient of reflection were observed during the process of epithelization of the defect. ( $\lambda = 0.63$  micrometers, 240 measurements) (Fig. 2).

The data presented testify that the reaction of biological tissue to laser radiation is not stable, since the dose of laser light must be corrected even within the limits of a single course of irradiation for each individual. By measuring the dose of laser radiation which affects the object, it is possible to carry out optimization of the time of irradiation of the biological object. Strict control of doses and objective evaluation of the necessary conditions of laser radiation will make it possible to use laser apparatus more rationally for medical-biological purposes and also to carry out comparative analysis of the results obtained under various conditions of its use.

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12255

CSO: 1840/2246

MARINE MAMMALS

UDC 576.7+576.2

EARLY EMBRYOGENESIS OF PERIPHERAL COMPONENT OF ACOUSTIC ANALYZER IN WALRUS  
(*Odobenus rosmarus divergens*)

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 288, No 4, Jun 86  
(manuscript received 27 Jan 86) pp 984-988

[Article by G. N. Solntseva, Institute of Developmental Biology imeni  
N. K. Koltsov, USSR Academy of Sciences, Moscow]

[Abstract] Histologic studies were conducted on the embryogenesis of the peripheral component of the acoustic analyzer in the walrus (*Odobenus rosmarus divergens*), to provide further data for better understanding of the evolutionary aspects of echolocation and adaptation to an aquatic existence. Studies on walrus embryos ranging in size from 10 to 125 mm (temporacaudal distance) revealed similarities and differences with strictly terrestrial forms. While the differentiation and maturation of the various morphological components of the external, middle and internal ear follow a sequence identical to that observed in terrestrial mammals, in the walrus the structural and functional are clearly discernible at a much earlier embryonic stage. Figures 1; references 14: 6 Russian, 8 Western.

12172/12955  
CSO: 1840/003

MEDICINE

ELECTRON MICROSCOPE DEVELOPED IN SUMY

Moscow Television Service in Russian VREMYA Newscast 051430

[Monitor's report in English of VREMYA newscast; date, not given, is probably 1986]

[Text] The Sumy "Elektron" Production Association has begun production of fifth-generation electron microscopes: a video report by V. Pidchenko and A. Dovgal. The report opens with shots of electron microscope pictures of a fly's eye and a human hair magnified thousands of times. These are nothing new to the specialist, says the reporter: but now even more detail can be obtained from new electron microscopes. A picture of a metal surface is shown: it is a magnification of 50 million times: even groups of atoms can be picked out. This is the kind of picture given by the electron microscopes now manufactured at Sumy: not only do they yield more detail, but they are easy to use. For example, whereas analysis of components in a metal would take an hour, now it can take a matter of seconds with these electron microscopes: they are equipped with a micro-analyzer which immediately produces all the necessary information on the metal on paper: in this way the technologist can give better specifications for the alloys needed. General Director of the Association, I. S. Lyalko (cap. id.), gives a video interview: he says that the new electron microscopes can be used widely in metallurgy, microelectronics, medicine, biology, biotechnology, agriculture; in this FYP the Association is going over fully to production of the new generation of electron microscope. [075]

/12955  
CSO: 1840/1301-E

## ENDOSCOPY IN PEDIATRICS--STATE PRIZE CANDIDATE

Moscow IZVESTIYA in Russian 28 Aug 86 p 3

[Article by V. Tabolin, head of the Department of Children's Diseases of the Second Moscow Medical Institute and Corresponding member of the USSR Academy of Medical Sciences: "In Competition for the USSR State Prize: To See the Invisible"]

[Text] The particular qualities of a small child's body are such that at first an illness can be hidden and its symptoms can be deceptive. A child cannot always talk about his condition correctly and parents are not always sufficiently observant.

Making the correct diagnosis remains the main problem of pediatrics. Yet this problem is still not always solved well and in good time.

This is why it was so important to become familiar with endoscopic research in pediatrics. For about a quarter of a century this research occupied the collective of scientists and physicians headed by Academician of the USSR Academy of Medical Sciences, Ye. Lukyanova.

A number of serious problems had to be solved. After all, they were faced with the prospect of having to conduct research with children quite young as well as with new-born and prematurely-born babies. This required a fundamentally new and very reliable procedures, new means for conducting examinations, and special anesthesia. All these problems were successfully solved by the above-mentioned group of scientists and physicians. It is of great significance that, in the research process, it is possible to carry out medical treatments--to act on the center of the inflammation and to stop internal bleeding. This allows us to avoid the risk of internal operations which is so very important in the case of children one year old or younger and of children weakened by illness. In fact, a number of medicinal measures carried out in the endoscopy process are operations without a scalpel.

Of course, endoscopy is not always possible. The authors of the work have determined not only clear indications for endoscopy, but also contraindications for it. They have also rendered a service by developing research methods for out-patient departments.

The results of this lengthy research are being introduced in many clinics. Monographs, articles and methodological recommendations have been published. A large number of pediatricians from different cities of the country have been trained in the research methods and are successfully applying them.

I believe that the work "The Development and Extensive Introduction into Pediatric Practice of Clinical and Out-Patient Endoscopy," which took many years, has been deservedly put forth in competition for the USSR State Prize for 1986.

13085/12955  
CSO: 1840/443

## BRIEFS

CONTACT-FREE THERMOMETER--A thermometer for which staff members of the General Physics Department of the Chernovtsy State University have received the gold medal of VDNKh [Exposition of Achievements of the National Economy] USSR does not have to be put under the arm. It instantly registers a thermal condition without touching the body. Moreover, it registers not only the temperature of the body as a whole, but also the separate parts on which the instrument's "eye" is trained. As medical personnel who are already working with this contactless measure of temperature confirm, it will find broad application in the early diagnosis of tumors and supervision of post-operative processes in internal organs when it is dispensed to the population on a mass scale. In addition to physicians, the new instrument has caught the attention of industrial workers. At the Chernovtsy metal workers' association, they have begun using it to regulate galvanizing baths. This makes for better quality in the covering of details and economizes on non-ferrous metals. The instrument operates on the basis of so-called anisotropic thermoelements. For many years, Chernovtsy scientists have been at work on studying their properties and practical application. Thirty inventions and patents have resulted from research carried out with them. [By V. Pelekh] [Text] [Kiev PRAVDA UKRAINY in Russian 9 Aug 86 p 2]

13085/12955  
CSO: 1840/443

BRIEFS

OSTEOGENESIS STIMULANT--(Armenpress)--The USSR Ministry of Health recommended a new method of treatment of bone fractures. Scientists at the Scientific Research Institute of Traumatology and Orthopedics in cooperation with specialists at the Institute of Epidemiology and Microbiology of the USSR Academy of Medical Sciences have developed an osteogenesis stimulant. It is grown on nutrient media from a human bone marrow particle. [Text] [Yerevan KOMMUNIST in Russian 18 Apr 86 p 4] 11439

CSO: 1840/1257

NOVEL CARDIAC PACEMAKER

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 11, 3-16 Jun 86 p 3

[Article by I. Yermolayeva]

[Abstract] Long years of cooperation between the Leningrad "Izmeritel" Plant and the head of its Medical Apparatus Laboratory, A. L. Baranovskiy, and Professor Yu. Yu. Bredikis of the Kaunas Medical Institute have greatly advanced the practice of cardiology. The latest achievement has been the completion and clinical approval of the new Kardiokompleks-05 pacemaker that in addition provides diagnostic information as to the kind and source of conduction defects. Current efforts of the joint engineering-clinical project are directed at instruments that not only provide diagnostic information, but also analyze it and suggest prognosis, all on the basis of microprocessor technology.

12172/12955  
CSO: 1840/1263

RESTORING VISION

Leningrad LENINGRADSKAYA PRAVDA in Russian 15 Jul 86 p 2

[Article by A. Korkin]

[Abstract] A method for restoring vision has been developed by Alla N. Shandurina and Vitaliy A. Khilko at the Institute of Experimental Medicine in the Human Neurophysiology Laboratory, based on electrical stimulation of the optic nerves. Hundreds of such procedures have been carried out to date, with marked improvement in vision in most cases. In fact, vision was restored to some individuals who had been blind. Even more effective has been a combined treatment in which, after two to three weeks of electrical stimulation, the patients receive visual stimulation in the form of flashes of light in the fourth to fifth postsurgical week. Moreover, recently it has been ascertained that simultaneous combination of electrical stimulation of the optic nerve and light flashes is even more beneficial. Such therapy, of course, is effective only in cases in which there is no damage to the eye or the visual centers in the brain, but only the optic nerve has been affected. However, it does offer new hope of vision to many patients for whom previously there was no hope.

12172/12955  
CSO: 1841/1266

COMPETENT MEDICAL INSTRUMENT MAKER ENMESHED IN BUREAUCRACY

Moscow IZVESTIYA in Russian 30 Jun 86 p 3

[Article by L. Ivchenko]

[Abstract] A bureaucratic situation is described concerning a certain Volkov, a competent, enterprising medical-instrument worker. Volkov designs and produces a number of medical instruments, without proper "authority", instruments equivalent to those obtained from foreign importers but at a much higher cost. Volkov's products are practically comparable to those imported but his institute is not in the "production" business and therein resides the problem of how to deal with Volkov. The problem is not unique; there are other Volkovs who on an "illegal" basis invent and produce, on limited scale, domestic equipment comparable with imports. Their institute must be either research- or product- oriented, but not both. How, then, does one deal with a "Volkov"? The article decries the sorry state of the bureaucratic stalemate.

7813/12955  
CSO: 1840/1275

UDC 613.647-07:616-001.21-036.3-07

PRENOSOLOGIC MANIFESTATIONS IN LOCAL APPLICATION OF CONSTANT OR VARIABLE  
(50 HZ) MAGNETIC FIELDS

Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 85  
(manuscript received 27 Feb 85) pp 23-25

[Article by Yu. P. Syromyatnikov, V. P. Zotkina, V. A. Roshchin and L. P. Pechenina, Moscow Scientific Research Institute of Hygiene imeni F. F. Erisman, Moscow]

[Abstract] A study of the conditions of labor at a plant producing permanent magnets showed that workers measuring coercive force of the magnets placed their hands into the area of the magnetic field (into the solenoid). The authors examined 114 such workers (54 males, 60 females), 20 to 40 years of age. The workers complained of increased sensitivity of the hands, cold hands, pain in the fingers, headache, fatigue and irritability. No symptoms of organic nervous system damage were found, but changes in autonomic and somatic innervation of the upper extremities, hyperhidrosis of the palms, decreased pain sensitivity and reduced skin temperature were observed. Half of the workers studied showed delayed return to normal hand-skin temperature after cooling of the hands. Nail-bed capillaroscopy showed capillary lability with a tendency toward spasm. The hand-chilling test is considered a good test for prenosologic signs of pathology in such workers.

6508/12955  
CSO: 1840/2184

UDC 614.7:546.121]-074

METHODOLOGIC PRINCIPLES OF SELECTION OF HIGH PRIORITY HALOGEN-CONTAINING COMPOUNDS WITH LONG-TERM BIOLOGICAL EFFECTS FOR HYGIENIC EVALUATION

Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 85  
(manuscript received 30 Jan 85) pp 33-35

[Article by G. N. Krasovskiy, N. Ya. Mikhaylovskiy, Yu. G. Marchenko, Yu. V. Gontar and A. Ye. Silvestrov, Scientific Research Institute of General and Communal Hygiene imeni A. N. Sysin, USSR Academy of Medical Sciences, Moscow; Ukrkommuniiprojekt, Kharkov]

[Abstract] The major difficulties in the formation of priority lists of halogen-containing compounds formed upon chlorination of water is the lack of a single criterion upon which priorities could be based, requiring multiple-criterion optimization utilizing criteria of quite different nature, including concentration and toxicity. Individual authors in the USSR and East Germany have suggested priority lists for these compounds based on their own interpretations of these criteria. Considering these lists, plus data on mutagenic activity of substances as well as their volume of production and utilization in industry, the authors' institute has suggested its own version of this priority list, consisting of 24 compounds in 3 levels of priority. The high priority group includes chloroform, carbon tetrachloride, dichlorobromo-methane, dibromochloromethane, trichloroethylene, perchloroethylene, bromo-form, dichloromethane, 1,2-dichloroethane and 1,1-dichloroethylene.  
References 14: 1 Russian, 13 Western.

6508/12955  
CSO: 1840/2184

UDC 572.51;312.6]-053.2(47)57

ESTIMATING PHYSICAL DEVELOPMENT: REPRODUCIBILITY OF RANGES OF MEAN VALUES  
OF BODY LENGTH OF CHILDREN IN VARIOUS TERRITORIES

Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 85  
(manuscript received 30 Jan 85) pp 52-55

[Article by Ye. A. Shaposhnikov, Ryazan Medical Institute imeni I. P. Pavlov]

[Abstract] An attempt was made to determine whether the range of mean body lengths of children born in the RSFSR, the Ukraine and Byelorussia, in the Western USSR, Central RSFSR, Siberia, the Far East, the Polar Regions and Central Asia differ from the nationwide standard lengths. Children of 7, 12 and 14 years were compared, using data collected during the 1950s, 60s and early 70s. Repeating variations in mean body lengths plus the near identical boundaries determined in different geographical regions indicate that there is a natural, objective norm for somatic development of children. The norm of body length for children living in geographically-remote regions is practically identical for children of the same age. References 14 (Russian).

6508/12955  
CSO: 1840/2184

UDC 614.7-073.916

USE OF X-RAY FLUORESCENCE FOR STUDY OF STATES OF ENVIRONMENT AND BIOLOGICAL MATERIALS IN HYGIENIC STUDIES

Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 85  
(manuscript received 13 Dec 84) pp 45-48

[Article by M. T. Dmitriev, B. I. Fradkin and V. A. Mishchikhin, Moscow]

[Abstract] The use of x-ray fluorescence is quite promising for studies of the environment and biological materials. The fluorescent radiometric method is a nuclear method used for rapid and simultaneous determination of large numbers of chemical elements under nondestructive conditions in solid, liquid and gaseous samples, providing reproducible results. Most elements are determined by the most intensive hard lines of the K series of characteristic radiation, elements with atomic number over 70--by the L series. The radio isotope radiation source must be selected to provide maximum effectiveness of excitation of the analytic line for the element to be determined, considering the presence of hindering elements. Analytical procedures are briefly outlined. The sensitivity of the method is equal to the best competing methods, on the order of 10 to 50 ng. Analysis time is 5 to 10 minutes, accuracy 2 to 4 percent. References 44: 30 Russian, 14 Western.

6508/12955  
CSO: 1840/2184

UDC 613.693.612.397

VARIATION IN CHANGES OF CERTAIN LIPID METABOLISM INDICES IN AIR TRAFFIC  
CONTROLLERS AT WORK

Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 85  
(manuscript received 15 Mar 85) pp 70-73

[Article by G. S. Kan, V. A. Kupriyanov and O. O. Malinovskaya, Scientific  
Research Institute of Neurosurgery imeni A. L. Polenov, Leningrad]

[Abstract] A number of neurohumoral regulation and metabolism indices were studied in air traffic controllers during working hours and during the same period on a day off. The controllers studied were males 25 to 39 years of age, some practically healthy, some suffering from neurocircular dystonia of hypertensive type. Studies of the excretion of catecholamines and lipid metabolism indicated significant differences between groups of practically healthy and hypertensive controllers. Occupational intellectual and emotional stress caused greater changes in lipid metabolism among hypertension patients, which were not restored to the normal during days off. Manifest hyperlipidemia among hypertensives resulted from an increase in the activity of the sympathetic-adrenal system, particularly its mediator segment. References 15: 12 Russian, 3 Western.

6508/12955  
CSO: 1840/2184

UDC 616-006-02:614.777:615.277.4]-07

EXPERIMENTAL STUDY OF INFLUENCE OF COMBINATION OF CERTAIN CHEMICAL WATER POLLUTANTS ON CARCINOGENESIS

Moscow GIGIYENA I SANITARIYA in Russian No 12, Dec 85  
(manuscript received 7 Feb 85) pp 8-10

[Article by N. N. Litvinov, V. M. Voronin and V. I. Kazachkov, Scientific Research Institute of General and Communal Hygiene imeni A. N. Sysin, USSR Academy of Medical Sciences, Moscow]

[Abstract] An attempt was made to model some natural situations by studying a number of combinations of established and proposed carcinogenesis-strength modifiers. The effect of combinations of aniline, benzene and carbon tetrachloride on carcinogenesis induced by nitrosodiethylamine was studied, as well as these substances plus cadmium. Studies were performed on 470 female mice which received all the chemical compounds with drinking water, provided without limitation. Although no statistically-reliable differences were observed among the experimental and control groups, there was an increase in the number of animals with tumors in the experimental groups at the MPC level. References 6 (Russian).

6508/12955  
CSO: 1840/2188

UDC 615.478.27:615.285.7].065:612.79.014.46:615.285.7

HYGIENIC EVALUATION OF QUANTITY OF HEXACHLOROPHENE ON SKIN FOLLOWING USE OF  
ANTIMICROBIAL LINENS

Moscow GIGIYENA I SANITARIYA in Russian No 12, Dec 85  
(manuscript received 17 Sep 84) pp 13-17

[Article by G. P. Bogachuk, A. I. Guseva and V. D. Trafimov]

[Abstract] Experimental patches of antimicrobial fabric were manufactured using industrial equipment and used to make antimicrobial viscose underwear containing 1.5-2 mass percent hexachlorophene, introduced by structural modification during manufacture. Reuseable products were also manufactured of cotton fabric containing  $4.0 \pm 0.5\%$  chemically-bonded hexachlorophene. The linens were tested at maternity hospitals in Moscow and Ivanovo, as well as a foundry and a research laboratory. Greatest hexachlorophene content of samples taken from the skin of the body was found on workers periodically exposed to high temperatures. The hexachlorophene content varied from 0.007 to 0.24 mg/dm<sup>2</sup> for 1-time usage linen, 0.006 to 0.16 mg/dm<sup>2</sup> for subjects wearing linens which were washed and reused. The quantity of hexachlorophene on the skin varied with the quantity of the preparation in mobile form in the products and the amount of perspiration of the subjects. Reuse of antimicrobial linens, even under the most unfavorable conditions of labor and climate, was found to be safe, the maximum quantity of hexachlorophene on the skin being not over the threshold values for all known toxic effects.

References 15: 12 Russian, 3 Western.

6508/12955  
CSO: 1840/2188

MICROBIOLOGY

ALL-UNION MICROBIAL CULTURE COLLECTION

Moscow OTCHIZNA in Russian No 5, May 86 pp 58-59

[Article by Aleksandr Androshin; photographs by Yu. Maksimova]

[Abstract] The All-Union Microbial Culture Collection is located in a small building in Moscow. It is headed by Lev Vladimirovich Kalakutskiy, doctor of biological sciences, who pointed out the importance of such collections and the impact that they have on human progress. The latter in particular has come to be appreciated by the man in the street with advances in biotechnology. The Collection, which represents isolates obtained from every ecological niche from the Arctic and Antarctic to volcanoes, deals exclusively with nonpathogens. The staff is constantly concerned with maintaining the purity of the isolates, and uses a variety of techniques for preservation, from lyophilization to storage at the temperature of liquid nitrogen (1-196°C). The Culture Collection may be regarded as a sort of a library where scientists can acquire the specific microorganisms that they need for their investigations, to which they can contribute their findings in the form of new isolates, and as a center that is active in exchange with scientists and similar establishments abroad. Photographs 4.

12172/12955  
CSO: 1840/1298

UDC 679.842.11.083.12

SOME METHODOLOGIC APPROACHES TO EXTRACTION OF PATHOGENIC ESCHERICHIA FROM  
OBJECTS IN ENVIRONMENT

Moscow GIGIYENA I SANITARIYA in Russian No 12, Dec 85  
(manuscript received 26 Nov 84) pp 45-47

[Article by T. V. Bey and Ye. M. Yurovskaya, Kiev Scientific Research  
Institute of General and Communal Hygiene imeni A. N. Marzeyev]

[Abstract] A study was made of the comparative effectiveness of certain accumulation media for the growth of pathogenic escherichia and their extraction from soil and sea water. The most widely used liquid accumulation media were tested, including glucose-peptone, lactose-peptone, lactose-bile broth and several other media. The pathogenic microorganisms were introduced at 100 cells per ml to the accumulation media, 1000 cell per gram of soil and 10,000 cells per ml of sea water. The pathogenic escherichia grew intensively in all accumulation media tested, increasing to tens and hundreds of millions per ml. The glucose-peptone medium and 10% bile broth were found to be effective for extraction of enteropathogenic intestinal bacteria from various environmental objects. Primary identification, it is suggested, should be begun by determining the genus of the colonies. An accelerated method is suggested for determining indole formation in microorganisms to reduce the time required for such studies and the consumption of nutrient medium. References 4 (Russian).

6508/12955  
CSO: 1840/2188

UDC 579.017.17

METABOLIC LIMITATION OF E. COLI GROWTH EFFICIENCY IN CHEMOSTAT

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 288, No 3, May 86  
(manuscript received 3 Jan 86) pp 737-740

[Article by V. B. Keshelava and N. V. Yeroshina, Institute of Biochemistry and Physiology of Microorganisms, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] To assess the metabolic factors responsible for diminished growth efficiency of *E. coli* under chemostatic conditions and onset of aerobic fermentation, *E. coli* K-802 was cultivated in a chemostat on glucose-mineral medium to evaluate the effects of oxygen, glucose, pyruvate, succinate and oxaloacetate. The resultant observations indicated that the mechanism responsible for the onset of aerobic fermentation in a situation with high growth rates ( $D > 0.38 \text{ h}^{-1}$ ) was due to the appearance of a metabolic 'constriction' point at the site of coupling of glycolysis and the TCA cycle. The latter consisted of inadequate pathways for pyruvate utilization (anaplerotic, citrate synthase, and glyoxylate shunt). The resultant shortage of substrates limited the respiratory activity of the *E. coli* K-802 culture and led to accumulation of glycolytic products representative of aerobic fermentation. The diminished activity of the TCA cycle enzymes constituted a secondary phenomenon attributed to the Crabtree effect and/or repression (inhibition) by the fermentative products. Figures 2; references 14: 4 Russian, 10 Western.

12172/12955  
CSO: 1840/001

UDC 577.1

PLASMID pBS241-CONTROLLED DIPHENYL METABOLISM IN PSEUDOMONAS PUTIDA BS893

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 288, No 3, May 86  
(manuscript received 7 Mar 86) pp 751-755

[Article by I. I. Starovoytov, S. A. Selifonov, M. Yu. Nefedova, V. M. Adanin, N. G. Vinokurova and G. K. Skryabin, academician, Institute of Biochemistry and Physiology of Microorganisms, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] Cursory data are presented on the metabolism of diphenyl in *Ps. putida* BS893 (pBS241), which resulted in the construction of a flow diagram for the degradation of this xenobiotic. The plasmid pBS241 was demonstrated to control the transformation of diphenyl via 2,3-dihydroxy-diphenyl, 2-hydroxy-2-keto-6-phenylhexa-2,4-dienic acid, and benzoate. The latter was then metabolized via the meta pathway. Elimination of pBS241 led to loss of activities of diphenyl oxygenase and catechol 2,3-dioxygenase, but was without effect on catechol 1,2-dioxygenase. Figure 1; references 15: 4 Russian, 11 Western.

12172/12955  
CSO: 1840/001

MILITARY MEDICINE

REGIMENTAL PHYSICIAN

Moscow KRASNAYA ZVEZDA in Russian 15 Jun 86 p 4

[Article by Ye. Agapova, correspondent of Krasnaya Zvezda]

[Abstract] A case history is reported of the "trials and tribulations" of a regimental physician. Starting from preventive saunas to field medications and work with military dependents, all these tasks are part of everyday activities of a military physician as manifested by the work of Petro Minyuk, be it in Afghanistan, in Karpathian Mountains or in the regimental headquarters.

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CSO: 1840/1274

MOLECULAR BIOLOGY

UDC 577.1

STIMULATION OF DOUBLE STRANDED RNA TRANSFORMATION OF PRO- AND EUKARYOTIC CELLS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 288, No 5, Jun 86  
(manuscript received 24 Jan 86) pp 1251-1253

[Article by R. A. Zakharyan, N. G. Azaryan and Dzh. G. Arutyunyan, Institute of Experimental Biology, ArmSSR Academy of Sciences, Yerevan]

[Abstract] One of the more important mechanisms of genetic transformation of pro- and eukaryotic cells is the transfer of DNA molecules through plasma membrane. The authors proposed a hypothesis that dsRNA (double stranded RNA) may act as a factor stimulating this transformation process and they attempted to verify it in this study. The effect of dsRNA was studied on the following processes: pf-1G phage reproduction in *Pseudomonas putida* PpG1 strain, conjugation and crossing of DA9, transfection of pf-1G phage in PpG1, transformation of pPBR322 in *E. coli* and transformation of  $\alpha$ tk<sup>-</sup>aprt<sup>-</sup> cells of complete DNA. The data obtained showed that dsRNA increases the number of cells capable of transformation, transfection and conjugation; the stimulating activity of dsRNA increased in presence of 0.01 M  $Ca^{2+}$ . Overall, dsRNA showed a specifically stimulating effect on conjugation and transformation processes of the prokaryotic cells. References 15: 5 Russian, 10 Western.

7813/12955  
CSO: 1840/004

PHARMACOLOGY AND TOXICOLOGY

NEW BIOLOGICALLY-ACTIVE COMPOUNDS

Moscow TASS in English 2 Aug 86

[Text]. New high-molecular weight compounds synthesized by chemists of Moscow university stimulate immunity and thus increase bodily protective functions in man.

The group of biologically active substances which they have obtained include growth stimulants, catalysts and solvents. Appropriate temperature conditions and additives have enabled the scientists to change the spectrum of their active properties as applied to the chemical and pharmaceutical industries, agriculture and metallurgy. Thus, in particular, experts are planning to use them as catalysts in a number of chemical productions and for agricultural pest control.

Interest in the synthesis of new materials has noticeably increased in recent years in connection with the spread of technologies based on the application of new modern materials. Experts say that the rate of progress in science and technology will depend in a large measure on such materials.

/12955  
CSO: 1840/1304-E

## NEW MEDICINE SYNTHESIZED

Moscow TASS in English 28 Jul 86

[Text] The institute of chemical physics of the USSR academy of sciences has succeeded in synthesizing a new drug, a bioantioxidant, for treating cardiovascular diseases and cancer. It is also believed to increase life expectancy.

"These biologically active substances were developed on the assumption that a medicine must, in the first place, defend the human body from adverse external influences," a prominent Soviet biologist, Professor Yelana Burlakova, explained.

"Many diseases begin with the destruction of the lipoids of cell membranes," she continued. "Affected by an infection or other harmful external influences, lipoids break into 'splinters', each of which is capable of producing thousands of new proteins, many of them toxic. It is their avalanche-like impact on the body that causes a disease, more often than not."

"We set ourselves the task of offsetting the action of the 'splinters' which are responsible for the development of new toxins in the body," she continued. "This is how we arrived at the theoretical model of the desired chemical compound. Having synthesized it, the scientists proved that the drug has a wide-ranging salutary effect on the body and is harmless to health."

"Scientists should start developing new medicines by first working out their theoretical formula to meet a purpose rather than mount a search to look for the drug at random in nature," professor Burlakova contends. "Only in this case can a drug, with preset properties, be synthesized and its side effects projected and reduced to a minimum. The future of pharmacology is in making drugs on purpose."

/12955  
CSO: 1840/1300

## MEDICAL APPLICATIONS OF MARINE TOXINS

Kiev PRAVDA UKRAINY in Russian 9 Aug 86 p 3

[Article by B. Lyanov, Moscow: "In the World of the Interesting: Life Is Prolonged by Marine Toxins"]

[Text] There has been a considerable number of important and interesting discoveries brought about by purposeful study of the life of sea and ocean inhabitants, which is being actively carried out by scientists at the All-Union Scientific Research Institute of Bioengineering. For instance, for a long time it was thought that the mere touch of a jellyfish, sea urchin, or ray was fraught with danger for man. Now it turns out that it is possible to benefit from many such marine organisms. This direction of research is very promising.

"Every second, the ocean is producing an enormous amount of proteins, fats, and vitamins," says Professor I. Azhgikhin, the institute's laboratory director. "It contains some substances which to this day haven't been found on land. It is precisely there that basic supplies of living organisms and plants have been concentrated--the sources of raw material for the preparation of medicines."

When we come to a pharmacy we have no idea whence come the medicinal substances which are put into ampules and tablets. But they are often obtained from mollusks and holothurians, starfish and sponges. Pharmacists have obtained from mollusks and holothurians, starfish and sponges. Pharmacists have created from them a new generation of antibiotics--cephalosporins--which are replacing penicillin. These preparations, first derived from marine fungi, are now produced by synthetic means.

One should make special mention of prostaglandins which play such a fundamental role in the active processes of cells. The use of this preparation in the treatment of cardiovascular diseases, in obstetrics, and in genecology is extremely promising. Production of prostaglandins from certain corals and algae is ten times cheaper than synthesizing them. There are still more examples. Of great practical importance is the compound tetrodotoxin. It is produced from the fish fugu [sic] and has been used successfully as an anesthetic and to lower blood pressure. A good treatment for ulcers is a compound made from sponges, mollusks, and algae.

Workers at the All-Union Scientific Research Institute of Bio-engineering have now developed remedies for adjusting fat metabolism, prevention of thromboses, improving the delivery of blood to vessels in the heart and brain, and compounds for arrhythmia.

The use of biologically-active marine substances is helping science to penetrate into the most cherished secrets of the living cell, especially those of the brain and spinal chord. Many of them are real pharmacological instruments allowing us to make important discoveries in the area of the molecular basis of nervous system activity and of the heart's conduction system.

In due time, no small number of decisions were accepted concerning the future development of scientific research connected with utilizing the bio-resources of the sea, including medicinal purposes. In particular, their great importance for the national economy, documentation has emphasized. Scientists have studied more than two hundred species of marine organisms, and demonstrated the advisability of broadening the scale of research. Methods for obtaining, in a single technological cycle, bio-active substances and forage, proposed for the first time in the world by Soviet scientists, passed successful trials and received high evaluation from interested ministries and the State Committee of Science and Engineering. They were not, however, required to go beyond the bounds of the laboratory. "Formerly it was under the jurisdiction of the USSR Ministry of Fishing, for which the aims and tasks of our collective were not paramount," a scientist explains. "The result of this was that we fell significantly behind research abroad in this area. Now the laboratory has been transferred and is subordinate to the Ministry of the Medical and Biology Industry. This has brought it closer to the user interested in obtaining medicinal raw material."

13085/12955  
CSO: 1840/443

INSTRUMENTAL STUDY OF NEURONS IN UZBEKISTAN

Tashkent PRAVDA VOSTOKA in Russian 13 Aug 86 p 3

[Editorial article]

[Abstract] Neurotoxins, components of various venoms, have been used to study nerve cell membranes. They are capable of passing through this membrane or of blocking it. Knowing the structure of such membranes one can understand the mechanism of their action and design special drugs to treat diseases of the nervous system or to develop ecologically-safe insecticides with selective activity. Uzbekistan scientists are collaborating actively in this field with Hungarian and East German scientists and publish their results in the "General Physiology and Biophysics" journal.

7813/12955  
CSO: 1840/1286

UDC 613.2-099+616.9-022.38]:001.5(47+57)

URGENT PROBLEMS OF DEVELOPMENT OF FOOD TOXICOLOGY IN CONNECTION WITH  
IMPLEMENTATION OF USSR FOOD PROGRAM

Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 85  
(manuscript received 18 Apr 85) pp 4-8

[Article by R. D. Gabovich and Ye. I. Goncharuk, Kiev Medical Institute]

[Abstract] A study was made of the problem of development of food toxicology, with particular attention given to the most important scientific and theoretical problems related to this area of science, the basis for solution of applied problems relating to the USSR food program. Food toxicology is studied as a branch of nutritional hygiene, developing scientific-theoretical and applied problems of assurance of chemical harmlessness of both nutritional raw materials and finished food products. A methodological plan of hygienic studies is suggested for regulation of the permissible daily dose and maximum permissible level of harmful chemical substances in food products. Steps include determination of the chemical structure of the substances being studied, the area and scale of utilization of the substance, methods of determining the substance, primary toxicologic description of the substance and prediction of the behavior of the substance in the food products, all part of the preparatory stage; the main stage, including determination of the level of nontoxic effect of the substance, study as indicated of long term effects of the substance, study of the influence of the substance on the taste properties of food products, study of the influence of the substance on the biological value of food products, study of the stability of the substance in food products and study of the actual content of the substance in food products; and a final stage including selection of a safety factor, distribution of the daily permissible dose among food products, determination of the limiting harm factor for various groups of food products and final regulation of the daily dose and maximum level in products. Future work should include a study of the content of the substance in the environment in general and a study of the possible influence of the substance on the health of the population by means of physiological, biochemical, clinical, hygienic, epidemiologic, statistical and other methods.

6508/12955  
CSO: 1840/2184

UDC 613.632-07+615.9.07]:681.31

USE OF "ELECTRONIKA MK-54" ELECTRONIC COMPUTER TO PROCESS RESULTS OF  
TOXICOLOGIC STUDIES

Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 85  
(manuscript received 5 Apr 85) pp 37-39

[Article by A. M. Shevchenko, V. S. Bogorad and A. P. Yavorovskiy, Kiev  
Medical Institute imeni A. A. Bogomolets]

[Abstract] A program is suggested for computation of the parameters most common in toxicology; variational series parameters and mean lethal dose (or concentration). The program, when applied to a sample with normal distribution, can be used to determine the arithmetic mean, mean error and mean square deviation. Sequences of keys to be pressed on the computer are presented in tabular form, as well as an example of application of the program. The program can be used with either the Electronika MK-54 or the Electronika BZ-34 machines for processing of results of toxicologic-hygienic investigations.

6508/12955  
CSO: 1840/2184

UDC 614.31:[664.8.036.55:621.795.3

TOXIC-HYGIENIC CHARACTERISTICS OF EP-5118 VARNISH INTENDED FOR USE IN CANNED FOOD INDUSTRY

Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 85  
(manuscript received 6 Feb 85) pp 84-85

[Article by A. G. Pestova, L. N. Ivanova, O. G. Petrovskaya and L. S. Kolomiyets, All-Union Scientific Research Institute of Hygiene and Toxicology of Pesticides, Polymers and Plastics, Kiev]

[Abstract] A study was performed to provide a basis for regulation of the conditions of application of pans and tops covered with epoxy-phenol varnish type EP-5118 in the food canning industry. The possible influence of the technology used to apply the varnish on hygienic characteristics of the coating was studied under laboratory conditions. It was found that the varnish can be sterilized without changing its external appearance or causing cracking or delamination. Extracts from the varnish were given to rat pups over a period of 2 months, yielding no signs of poisoning. The level of migration of monomers was found to vary inversely with drying temperature of the varnish. The optimal polymerization temperature was found to be 320°C. The varnish is recommended for coating of metal covers and glass containers for children's food, but is not suitable for coating of metal cans which are to contain children's food. References 6 (Russian).

6508/12955  
CSO: 1840/2184

UDC 613.632.4:[546.262-31+546.264-31]:574.682

COMBINED EFFECT OF CARBON MONOXIDE AND DIOXIDE ON SUBJECTS WORKING IN SEALED CHAMBERS

Moscow GIGIYENA I SANITARIYA in Russian No 12, Dec 85  
(manuscript received 22 Nov 84) pp 17-19

[Article by A. V. Sedov, N. A. Surovtsev, S. V. Bychkov, G. Ye. Mazneva and T. A. Lukicheva]

[Abstract] In order to determine the combined effect of carbon monoxide and dioxide on the human body in a sealed chamber, special experimental studies were performed involving nine persons 20 to 35 years of age in 10 series in a chamber with controlled temperature and moisture content. In all series the subjects were maintained at a comfortable temperature of 20°C, relative humidity 50%, and performed physical work at 400 kcal/hr for periods of 2 to 5 hours. The combined effect of a gas mixture containing 15 to 100 mg/m<sup>3</sup> CO and 0.5 to 1 percent CO<sub>2</sub> under these conditions was found to be independent. CO at 300 mg/m<sup>3</sup> plus 3 to 5% CO<sub>2</sub> with 2 hours of heavy physical labor was accompanied by an increase in the toxic effect of the substances over and above the independent effect, combined action coefficient 1.30-1.35. An equation is presented for adding the toxic effects under these conditions to yield a new, lower maximum permissible concentration for the total of the two substances. References 9: 7 Russian, 2 Western.

6508/12955  
CSO: 1840/2188

UDC 616-003.725:611.81

EFFECTS OF DES-TYR-GAMMA-ENDORPHIN AND TETRAPEPTIDAMIDE ON DOPAMINE BIOSYNTHESIS IN RAT BRAIN SYNAPTOSONES

Yerevan NEYROKHIMIYA in Russian No 3, Jul-Sep 84  
(manuscript received 19 May 83) pp 227-235

[Article by A. Yu. Shemanov, V. S. Kudrin and K. S. Rayevskiy, Scientific Research Institute of Pharmacology, USSR Academy of Medical Sciences, Moscow]

[Abstract] Wistar rats were employed in a study to assess the effects of des-tyr-gamma-endorphin (DTE) and tetrapeptidamide (TPA; synthetic tetra-peptide analog of enkephalin) on dopamine (DA) in synaptosomes preparations derived from striatum and nucleus accumbens septi (NAS). In a concentration of 10 M, DTE reduced the rate of striatal tyrosine hydroxylation and increased the K /V ratio by 60% ( $P<0.05$ ); higher concentrations of DTE were less effective in this respect. TPA has a similar effect on the striatum at a higher concentration (10 M). DTE also induced similar changes in the NAS preparation when present in a higher concentration (10 M), while TPA was without effect. However, neither DTE nor TPA potentiated the inhibitory effects of DA on tyrosine hydroxylation in either the striatal or NAS preparation. Thus, while DTE and TPA were shown to exert a direct modulating effect on presynaptic tyrosine hydroxylation and involvement in dopaminergic transmission in the nigrostriatal and mesolimbic systems, considerable differences were evident in the mechanisms of action of DTE and TPA. Figures 3; references 31: 10 Russian, 21 Western.

12172/12955  
CSO: 1840/1292

PHYSIOLOGY

UDC 577.3:612.017.2(211)

BIORHYTHMIC ASPECTS OF INTERCONTINENTAL ANTARCTIC ADAPTATION

Frunze IZVESTIYA AKADEMII NAUK KIRGIZSKOY SSR in Russian No 2, Mar-Apr 86  
(manuscript received 14 Nov 85) pp 35-39

[Article by A.L. Maksimov and T.B. Chernook: "Biorhythmic Aspects of Intercontinental Antarctic Adaptation"]

[Text] Biorhythmic research today has been making increasing use of adaptation to a new environmental habitat to study ecological-physiological mechanisms [1, 2].

Many works have been devoted to the study of the functioning of various physiological systems under Antarctic conditions, including attempts made to study the effect of the polar day and night on the biorhythms of polar research workers at both coastal and intercontinental stations [3,4].

The biorhythmic examinations made of polar research workers at the high-altitude Antarctic Vostok station (3488 M) are of great interest from the standpoint of evaluating adaptation conditions. We know that adaptation to a height in the range of 3500 M under the conditions of Pamir and Tyan-Shan occurs in several stages, and moreover, the stable phase of the adaptation is mainly formed by the 45th day [5]. Considering the high extremality of the conditions of the intercontinental Vostok station (hypoxia, geomagnetic fluctuations, the polar night, extreme dryness of the air, etc.), it may be assumed that polar research workers, in order to achieve a relatively stable adaptability, require a considerably longer time than 1 1/2 months. By the middle of the winter period, stabilization of the physiological function response may be expected, making it possible for the organism to live and work without stressing the adaptive mechanisms. Important information on the adaptation potentials of an organism can be obtained by studying the cyclic recurrence of the physiological processes [6, 7], which exist at all organizational levels of living organisms and make it possible to seek ways to predict and correct the disturbances arising with the effect of unfavorable factors on the organism [8]. At the same time, the most significant point in the biorhythmic investigation is the fact that the disturbance in the circadian rhythm of the organism can be adequately judged from the change in the physiological parameters of the organism without additional functional loads. This makes the study most valuable under extreme environmental conditions, when the organism is already experiencing a highly

stressful effect and each additional functional load can induce dysadaptation phenomena against the background of exhaustion of physiological reserves.

In order to clarify the question of whether a stable adaptation phase occurs in polar research workers after 6 months of wintering at a polar station under conditions of Antarctic high altitude, as well as to evaluate the rearrangement in the structure of the biorhythmic status, we carried out a comparative study of the circadian rhythm of a number of functional indicators in a person before the Antarctic wintering period and after half of the sojourn under the conditions of the high-altitude Vostok station.

The work was carried out at the Vostok station during the 27th SAE [Soviet Antarctic Expedition]. Seventeen polar research winterers were studied. Background studies had been made of the same persons at the start of the Black Sea voyage (14 persons) and there was no background examination of the three persons who had arrived in Antarctica by air. The indicators were recorded at 0700, 1100, 1500, 2300 and 0300 local time. Each one tested in the 24-hour check took part one time. The body temperature was recorded sublingually by means of an electric TPM thermometer, the pulse rate was counted by a cardiogram and a saliva sample was collected, in which the sodium and potassium content was determined by the flame photometry method, using a Tseysov photometer [9]. The check time in each temporal period was not over 5 minutes. The data was processed by a Kosinor\* analysis [10].

In the morning background studies, the pulse rate (PR) was  $68 \pm 2$  beats/min, and then a marked rise toward 1500 hrs ( $79 \pm 2$  beats/min) was observed, with a subsequent reduction by nighttime. The group was characterized by quite uniform indicators. The Kosinor analysis revealed a 24-hour rhythm with the following parameters: oscillation amplitude equal to 5.94 beats/min and an acrophase occurring at 1500 hours (Fig. 1). The same trend in shifts was retained in the background studies related to temperature. The nighttime reduction in it was replaced by a daytime rise. Its maximum temperature was reached at 1900 hours (Fig. 2). The 24-hour temperature range reached  $0.8^{\circ}\text{C}$  ( $35.9\text{--}36.7$ ). A 24-hour rhythm with an oscillation amplitude equal to  $0.2^{\circ}\text{C}$  and an acrophase occurring at 1624 hours were revealed.

A study of the biorhythms of the salival content of sodium and potassium, the indicators of vegetative homeostasis [11] established the fact that in the background studies the highest values were noted in the evening and at night. A 24-hour and 12-hour rhythm for sodium, with amplitudes of 5.22 and 5.4 m-equiv/l were revealed, as well as acrophases occurring at 0410 and 0418 hours respectively, and a 24-hour rhythm of potassium removal with an amplitude of 3.16 m-equiv/l and an acrophase equal to 5 hrs 24 min (see table).

In the middle of the winter period, occurring during the polar night, another picture was revealed with respect to biorhythms for all the indicators studied, which lay in a displacement of the circadian rhythm in the direction of ultradianal components. For example, the greatest PR value occurred at 0300 ( $81 \pm 3$  beats/min), and at the same time there was no uniform reduction (in the evening and at night) or uniform rise (daytime) of the indicator, as was

\*Kosinor: Editor--cosine analysis?

characteristic for the background studies. In addition, the dispersion range of the indicator increased ( $43 \pm 280$ ), which points to a great nonuniformity in the response in the group examined in the course of the 24-hour period. The 24-hour rhythm proved to be statistically negligible and at the same time its acrophase was shifted in the nighttime (0030 hours) and a considerable damping of the amplitude was noted (2.39 beats/min). If one takes into consideration the fact that the amplitude of the oscillations serves as a "measure of the resistance of the oscillator to external effects" [1], the decrease in the amplitude of the oscillations and such a sharp shift in the acrophase in the earlier period indicates the considerable stress experienced by the polar research workers' organisms in this period. An autospectral analysis showed that a considerable part of the general dispersion of the process is concentrated at the ultradian frequencies, and given the statistically known 12-hour rhythm, the value of the average level of pulse rate changes (it increases to 75 as opposed to 63 beats/min), as do the oscillation phases, which fall during the nighttime hours (0142 hours). The shift of the 24-hour rhythm to 12-hour ones and the displacement of the acrophase from daytime to nighttime (Fig. 1) indicate a considerable discrepancy in the levels of the heart activity and the activity of the organism.

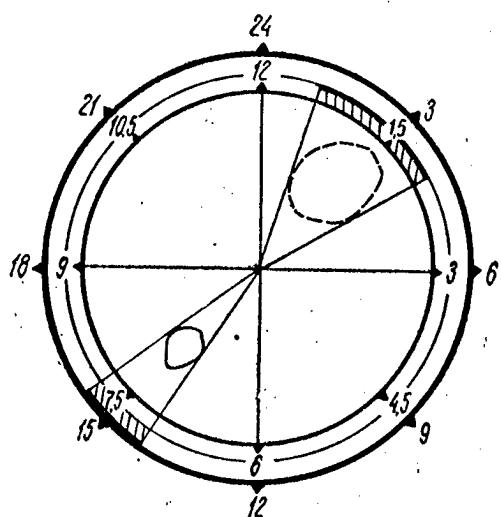


Fig. 1. Kosinors of the diurnal pulse rhythms.

The solid line indicates the ellipse of error for background studies (24-hour rhythm); the dotted line is for study in the polar night (12-hour rhythm).

The 24-hour physiological rhythms were usually synchronized by geophysical and social transducers which have a 24-hour period and a stationary phase-amplitude structure. Free-flow rhythms are ordinarily observed in those examined under conditions of insulation from the external time transducers. Catching the endogenous oscillator rhythm, particularly with a social transducer, often leads to inner desynchronization of the rhythms, when the circadian rhythms of different functions have a varying width of the catching window, for example, the temperature rhythm at first goes out from control of the "inducer" [1]. In this case the 24-hour rhythm of the physiological functions undergoes profound

rearrangement, leading to the person's chronophysiological adaptation to the new environment and a change in the phase-amplitude structure of the circadian rhythms. In our opinion, this is precisely what happens in the middle of the winter period which falls within polar night in the Antarctic. This assumption was confirmed in studying the biorhythms for all the indicators studied by us. As can be seen from Fig. 2, the 24-hour temperature range in the period studied was much less ( $0.3^{\circ}\text{C}$ ) and there were no statistically significant 12- and 24-hour rhythms. In the opinion of N.I. Moiseyeva [8], in basically healthy persons, well adapted to the change in environmental conditions, a great range of values is noted in the constant in the course of the 24-hour period, as is a relative stability in the structure of the curves. In persons who have adapted poorly, the curves reflecting the dynamics of the same function differ considerably. There is less variation in the values in the course of the 24-hour period for them. On the prognostic plane, the appearance of a "plateau" (blood thickening) and a shift in the maximum and minimum of the indicators is evidence of an unfavorable trend in the adaptation process. Consequently, the temperature indicator in our studies attests to considerable stress on the adaptation mechanisms in polar research workers in mid-winter.

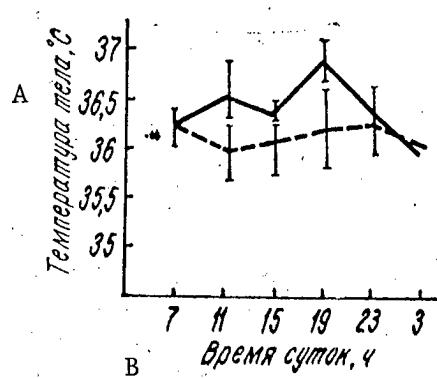


Fig. 2. Diurnal Rhythm of Body Temperature

The solid line indicates the diurnal rhythm of the body temperature in background studies; the dotted line--in the middle of the polar night. The confidence interval is indicated for  $p < 0.05$ .

A--body temperature, in  $^{\circ}\text{C}$   
B--time of day, in hours

A study of the biorhythms of the sodium excretion from the saliva in the polar night showed an increase in the spread of the indicators and their nonuniformity, as compared with the background studies. At the same time, the rhythm was noted as a 12-hour one. The acrophase occurred at 2 hrs 36 min (Table 1), which was 1 hour and 42 minutes less than in the control studies, i.e., again, as for the other indicators, in mid-winter there was a stimulation of the ultradian rhythm, and even in the absence of statistically significant rhythms, a spectral analysis showed the presence of well marked peaks from the ultradian rates.

The coinciding of the sodium minimum in the saliva with the maximum cardial activity attests to the activation of the sympathoadrenal system occurring during the time awake, despite the absence of a natural daylight factor [11, 12]. In our studies the background indicators of sodium in the saliva also have the highest value at night, but during the polar winter the minimal values of sodium in the saliva, combined with a high level of cardial activity, occur in the period of nighttime rest. This change in the interrelation of the indicators is the result of a considerable rearrangement on the part of the vegetative functions of the organism.

Table

Results of the Kosinor Analysis of Diurnal Rhythms in the Sodium and Potassium Excretion From Saliva in Polar Researchers at the Vostok Station, 27 SAE

Parameters	Sodium in saliva, m-equiv/l		Potassium in saliva, m-equiv/l	
	24 hr	12 hr	24 hr	12 hr
Background Studies				
Level	15.59	15.59	23.61	--
Amplitude	4.02≤5.22≤6.42	1.91≤4.15≤6.39	0.10≤3.61≤7.12	
Acrophase	3.8≤5.4≤7.2	3.0≤4.3≤5.3	3.0≤5.4≤8.3	
Studies in Polar Night				
Level	--	14.7	--	23.07
Amplitude		0.15≤3.61≤6.08		1.40≤5.57≤9.74
Acrophase		1.2≤2.6≤4.0		1.7≤2.5≤3.6

Excretion of potassium from the saliva, in contrast to all the other indicators, in the period analyzed differed in the large spread of values in the course of the 24-hour period (dispersion 34±142). In contrast to the background of the mid-winter 24-hour rhythm, it is transformed to a 12-hour one, with an oscillation amplitude equal to 5.57 m-equiv/l and an acrophase--2 hrs 30 min. The marked rise in oscillation amplitude (5.57 as against 3.61) also reflects the presence of a stress reaction [7]. The mechanism of increasing the amplitude of the initial oscillations of S.I. Stepanova[2] is applicable due to the activation of the discharge and reestablishment of the energy and plastic resources of the redirection of the organism's functional systems.

Thus, in mid-winter, the amplitude of the curves of the pulse, temperature and sodium is markedly concentrated, in contrast to the potassium, where there is reverse tendency. Evidently, we observe here a double-unit phenomenon reflecting the stressed state of the organism. Only with the marked increase in amplitude does the process go along the path of stress of the physiological functions operating at a higher level, and with a decrease--along the path of exhausting the functional reserves. In the first instance the phenomenon is more favorable for the organism, since with a sufficient breadth of physiological reserves there is a compensation of the process, except at a new regulation level. In the second instance the process is connected with inadequate expenditure and reduction of the energy and plastic resources, which also characterizes the phenomenon of exhaustion reflected in the damping of the amplitudes.

The studies made make it possible to draw the following conclusions:

In mid-winter, falling during the polar night, considerable changes were noted in the biorhythmic indicators with respect to the periodic organization and pulse-amplitude characteristics;

In this period there was an inversion in the rhythm of the pulse rate, ultradianal phenomena consisting of a circadian rhythm appeared, and at the same time a maximum in the rate of the cardiac contractions occurring at nighttime coincided with a minimum retention of sodium in the saliva, which attested to the activation of the sympathoadrenal system during nighttime rest;

No statistically significant 24- and 12-hour rhythms were revealed with respect to the temperature indicator and, at the same time, a considerable flattening of the diurnal curve of the body temperature occurred;

The potassium and sodium excretion from the saliva was characterized by a great value spread during the 24-hour period and the appearance of ultradianal rhythm with the 12-hour period;

The above statements make it possible to conclude that after a 6-month stay at the Vostok station, no stable adaptation phase was found in the polar research workers of the 27th SAE, which was evidently the result of the extreme wintering conditions.

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12151

CSO: 1840/1282

UDC 612.822.1:591.543.42

## NEUROCHEMICAL CHANGES IN HIBERNATION

Yerevan NEYROKHIMIYA in Russian No 3, Jul-Sep 84  
(manuscript received 14 Jul 83) pp 306-317

[Article by E. Z. Emirbekov and S. P. Lvova, Neurochemistry Special Problems Laboratory, Daghestan State University imeni V. I. Lenin, Makhachkala]

[Abstract] A brief literature review is presented on the data accumulated in the neurochemical literature on biochemical changes in the brain during hibernation. It has been shown, for example, that during hibernation many of the oxidative enzymes and flavin-dependent dehydrogenases evidence high levels of activity, whereas the phylogenetically newer elements, such as the cytochrome oxidases, present with diminished activity. In conjunction with these observations, the cortex has been shown to be unusually susceptible to cyanides during hibernation. With hibernation, serotonin levels show elevation while catecholamines show concomitant depression, a process reversed on waking, with the actual changes suggesting profound alterations in the thermoregulatory center. However, despite the facts and figures that have been accumulated, these quantitative data are not yet sufficient to formulate an unequivocal concept of hibernation. References 65: 29 Russian, 1 Bulgarian, 7 Ukrainian, 28 Western.

12172/12955  
CSO: 1840/1292

UDC 612.8.015:547.953:612.273

EFFECTS OF EXTREME HYPOXIA ON PHOSPHOLIPID METABOLISM IN SUBCELLULAR  
STRUCTURES OF RAT BRAIN

Yerevan NEYROKHIMIYA in Russian No 3, Jul-Sep 84  
(manuscript received 29 Aug 83) pp 284-287

[Article by S. V. Gasteva, T. Ye. Rayze and L. M. Sharagina, Institute of  
Physiology imeni I. P. Pavlov, USSR Academy of Sciences, Leningrad]

[Abstract] Wistar rats were employed in a study designed to ascertain the effects of moderate and extreme hypoxia on the status of phospholipid metabolism in the cerebral hemispheres. Maintenance of the animals in a pressure chamber at 266.90 gPa for 2 h, with periodic reduction to 213.38 gPa, resulted in profound reduction in phospholipid turnover and 40-45% reduction of the phospholipid levels in the mitochondria and synaptosomes. The reduction in the concentration of the phospholipids in the myelin, cytosol and microsomes ranged from ca. 10 to 20%. Exposure to moderate hypoxia (266.60 gPa) led to a similar depression of the turnover rate, but with no decrease in the levels of the phospholipids. The data were interpreted to indicate that moderate hypoxia depressed phospholipid anabolism and catabolism to an equal extent, whereas extreme hypoxia led largely to inhibition of the biosynthesis of phospholipids in the cerebral hemispheres. Tables 1; references 10: 5 Russian, 5 Western.

12172/12955  
CSO: 1840/1292

UDC 577.4

GENERAL BIOLOGICAL CHARACTER OF ADAPTIVE CAPACITY OF MAMMALIAN METABOLISM  
IN RESPONSE TO DIVERSE AND EXTREME ENVIRONMENTAL FACTORS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 289, No 1, Jul 86  
(manuscript received 13 Nov 85) pp 250-252

[Article by B. M. Grayevskaya and N. N. Zolotareva, Institute of Evolutionary Animal Morphology and Ecology imeni A. N. Severtsov, USSR Academy of Sciences, Moscow]

[Abstract] Biochemical studies were conducted to determine optimal metabolic parameters delineating resistance to diverse and extreme environmental factors in mammals. Preliminary studies with two lines of mice (BALB/c and C57Bl) differing in susceptibility to ionizing radiation demonstrated that blood glucose levels and changes in the level following epinephrine administration are indicative of adaptation, and reflect the status of the sympathetic nervous system. Within a given line of mice, the socially dominant individuals showed greater adaptability to stress and survivability. Data derived for several mammalian species showed that, on the basis of blood glucose levels and response to epinephrine challenge, susceptibility to environmental stress can be predicted with an accuracy of 80% on an individual basis. Optimal blood glucose levels and 15 and 30 min glycemic responses to epinephrine are tabulated for humans, cattle, rats, mice, and dolphins. Figures 1; tables 2; references 11: 10 Russian, 1 Western.

12172/12955  
CSO: 1840/006

UDC 612.82-616.003.93

INVOLVEMENT OF OPIOIDERIC BRAIN STRUCTURES IN WOUND HEALING

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 289, No 1, Jul 86  
(manuscript received 11 Mar 86) pp 240-242

[Article by O. B. Ilyinskiy, Ye. S. Kondrikova, S. Ye. Spevak and A. I. Solovyeva, All-Union Cardiological Scientific Center, USSR Academy of Medical Sciences, Moscow]

[Abstract] Wistar rats were employed in a study on the role of opioidergic brain structures in wound healing, using animals with electrodes implanted in the central gray substance and surgical skin wounds. Various modes of electrical stimulation of the central gray substance -- one of the major antinociceptive systems in the brain -- for 6 days after application of the skin wound facilitated healing, shortening the time required for complete resolution by 21.8%. Stimulation at -3 days and +3 days relative to the surgical procedure was equally effective. However, administration of naloxone (2.0 mg/kg, i.p.) prior to each stimulation abolished the beneficial effects of stimulation. These observations were interpreted to indicate that the mechanism underlying the beneficial effects of electrical stimulation of the central gray substance in promoting wound healing was due to the release of endogenous opioids. Such mechanisms also appear to underlie the therapeutic effectiveness seen with various forms of acupuncture and massage.

Figures 1; references 14: 11 Russian, 3 Western.

12172/12955  
CSO: 1840/006

PUBLIC HEALTH

BRIEFS

SANITARY-EPIDEMIOLOGICAL STATION--P. Burgasov, USSR chief sanitation specialist, answered the editorial department in connection with the article "Two Blows Below the Belt" published on 25 March of this year in MOSKOVSKAYA PRAVDA. A regulation dated 31 March by A. Zaichenko, deputy chief state sanitation specialist, revoked the unfounded actions of the Krasnopresnensk Sanitary and Epidemiological Station with respect to the organization and utilization of the basin and recovery center of the 112th school. N. Klementyeva, director of the school, and O. Smirnova, chief physician at the sanitary and epidemiological station of the city of Moscow, were notified of this decision. [Text] [Moscow MOSKOVSKAYA PRAVDA in Russian 6 May 86 p 3]  
11439

CSO: 1840/1257

UDC 613.6:331.875.1]:008

IMPROVEMENT OF STATE SANITARY PREVENTIVE INSPECTION OF DEVELOPMENT AND  
INTRODUCTION OF EQUIPMENT TO PRODUCTION

Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 85  
(manuscript received 27 Feb 85) pp 29-32

[Article by D. P. Timoshina, I. V. Kazakevich and V. M. Shetsova, Main  
Sanitary-Epidemiologic Administration, Ukrainian Ministry of Health, Kiev;  
Scientific Research Institute of Labor, Hygiene and Occupational Diseases,  
Krivoy Rog]

[Abstract] Analysis and summary of the experience of the Sanitary Epidemiologic Service in the UkrSSR as well as data from the literature have allowed determination of the basic principles of organization and conduct of State sanitary preventive supervision of the development and introduction of new equipment to production. Preventive State-sanitary-supervision of development and industrial manufacture is required for products involving direct participation of man in their control or products which influence the conditions of labor and the environment of the workplace. Stages include hygienic evaluation of plans; hygienic evaluation of new products during testing; monitoring of industrial production equipment; monitoring of the introduction of new equipment to operation at industrial enterprises. Particularly important is participation of sanitary-epidemiologic specialists in the work of acceptance commissions and the development of standardized methodologic approaches for hygienic evaluation of equipment. Equally important is monitoring of the activity of organizations involved in the development of equipment and technical documentation for equipment. References 8 (Russian).

6508/12955  
CSO: 1840/2184

UDC 616.152-074

CONTENT OF IRON, COPPER AND MANGANESE IN BLOOD OF PEOPLE OF VARIOUS GROUPS  
AT VARIOUS TIMES OF YEAR

Moscow GIGIYENA I SANITARIYA in Russian No 12, Dec 85  
(manuscript received 18 Feb 85) pp 21-24

[Article by V. V. Nasolodin, Yaroslavl University]

[Abstract] A study is presented of the dynamics of the concentration of iron, copper and manganese in the plasma and formed elements of the blood of practically healthy subjects of various groups in various seasons. A total of 76 persons were observed for the course of one year. Groups included forging-machine operators, military school students, secondary school students and young skiers. The content of trace elements in the blood was found to fluctuate significantly even among healthy young persons. During the fall in all groups there was a significant increase in the concentration of iron in the blood plasma. During spring and summer there was a sharp and reliable decrease. Iron content differed still more among the different groups. Those performing physical labor or training showed an increase in the concentration of iron in the blood cells in the fall after vacation. Students not involved in sports showed little change in iron content in the blood during the course of the year. Copper content remained practically unchanged through the course of the year in the workers and young sportsmen, whereas non-athletic students showed a reliable increase in copper content in fall. Manganese content was relatively constant through the year, though reliably higher among workers and sportsmen. References 16: 14 Russian, 2 Western.

6508/12955  
CSO: 1840/2188

UDC 614.777:661.185]-07

SANITARY-MICROBIOLOGICAL EVALUATION OF BARRIER FUNCTION OF MODERN TAP WATER PURIFYING STRUCTURES DURING CONTAMINATION OF HYDROSPHERE WITH SURFACE-ACTIVE AGENTS

Moscow GIGIYENA I SANITARIYA in Russian No 12, Dec 85  
(manuscript received 3 Jan 85) pp 10-13

[Article by I. E. Ilin, Saratov Medical Institute]

[Abstract] A study is presented of the barrier function of modern water treatment facilities with respect to bacterial and viral contamination considering the fact that microorganisms now exist in water in a new form, redistributed by the presence of surface-active agents which cause the microflora to be concentrated on the surface of the water in a film of microscopic thickness. The object of the study selected was *E. coli*, added in saline solution at the rate of 1,000 microbes per liter of water. Contamination of the water with detergents was modelled by the use of highly-stable hard surfactants, both nonionogenic and anion-active types introduced at 0.5 mg/l. The presence of detergents was found to decrease the effectiveness of the barrier function of modern water purification facilities against bacterial and viral contamination. The degree of inactivation did not exceed 40 to 50%. The most vulnerable links in the purification chain were found to be coagulation and chlorination.

6508/12955  
CSO: 1840/2188

UDC 614.73+612.014.481/.482]([47+57]-17)

SOURCES AND LEVELS OF IRRADIATION OF RESIDENTS IN FAR NORTH

Moscow GIGIYENA I SANITARIYA in Russian No 12, Dec 85  
(manuscript received 11 Feb 85) pp 30-32

[Article by M. N. Troitskaya, A. P. Yermolayeva, L. A. Teplykh and P. V. Ramzayev, Scientific Research Institute of Radiation Hygiene, RSFSR Ministry of Health, Leningrad]

[Abstract] Major radiation sources in the far north include the natural background radiation, internal irradiation from isotopes in the food, global radioactive fallout from nuclear tests and x-ray diagnostic procedures. During annual visits to permanent observation posts in the far north, materials were collected to allow computation of the annual radiation dose of residents in the area. The data collected indicate that the gamma ray background in open terrain and in houses in the far north is equal to the average for the territory of the USSR. The most important radio nuclides are  $^{222}\text{Rn}$  decay products, representing some 50% of the effective equivalent dose from all types of radiation. Calculation of the total equivalent dose for residents of the far north indicated that it was almost double that of residents of the USSR as a whole, created primarily by radon and products of its decomposition in the air and in the food. References 5. (Russian).

6508/12955  
CSO: 1840/2188

MOSCOW HEALTH PROGRAM

Moscow MOSKOVSKAYA PRAVDA in Russian 6 Aug 86 p 3

[Abstract] The Executive Committee of the Moscow Soviet has approved a multi-faceted health program entitled "Zdorovye" [Health] for the 1986-1990 period. As formulated, the program will overcome bureaucratic inertia in the administration of public health measures in Moscow, and in providing for stronger environmental monitoring. Primary emphasis in the health sphere will be placed on preventive measures, with the coming years seeing a further expansion of medical and recreational facilities for all age categories. Working conditions will also be subject to sanitary overview and pace will be maintained with industrial development. Finally, extensive use of the latest in computer-based data processing technology will ensure that the Zdorovye program will operate efficiently and in a timely manner.

12172/12955  
CSO: 1840/1261

## BUREAUCRACY IN MEDICAL ADMINISTRATION

Tashkent PRAVDA VOSTOKA in Russian 18 Jul 86 p 3

[Article by V. Vaynshteyn]

[Abstract] Paper pushing is not a technical but a political concept. The results of such paper pushing and of medical formalism were reported previously. In the present report, attempts were made to correct this situation. A case was made for "bureaucratic solution of problems" based on proper paper shuffling without any practical results. However, a decision was made to get rid of such a non-productive solution once and for all. A case in point was reported for the Fergana Oblast. Documentation required for substantiating any case had to be factual and realistic. Ministerial control of the assigned tasks was the next step introduced to correct the situation. No new tasks were accepted on the basis of previously discussed approaches. The solution proposed for the problem under discussion was a new report-analysis document based on realistic principles.

7813/12955  
CSO: 1840/1273

URBAN HEALTH STATUS

Moscow IZVESTIYA in Russian 8 Aug 86 p 3

[Article by L. Ivshenko]

[Abstract] A program for "Health in 1986-1990" has been developed in Moscow. In an interview with the director of Main Administration of Public Health, V. Mudrak, the fine points of this initiative were discussed. Evidently, the extent and quality of medical assistance in Moscow City were inadequate. The purpose of this new program is an all encompassing approach as there are no priorities in public health; everything is interconnected, all aspects are equally important. Creation of 64 polyclinics with a capacity of 43,000 visits per shift was proposed. By 1990, annual examinations of everybody should become a standard procedure. The number of beds dropped recently from 12.1 to 11.6 per thousand inhabitants. Several new hospitals are to be constructed to alleviate this problem. The staffing of these hospitals is another problem: currently there is a shortfall of 9,000 physicians and 23,000 medical service personnel. An agreement was reached with the Ministry of Health to direct 1,600 graduates of local medical institutes to municipal hospitals, annually. The question of medical service personnel is an unresolved problem. Attention must be paid to environmental and social health aspects. The prevention program will address measures to fight alcoholism, environmental pollution and will advocate massive participation in organized sport activities.

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CSO: 1840/1280

## AMPHIBIOUS METHOD -- MEDICAL WAY

Moscow MOSKOVSKAYA PRAVDA in Russian 2 Aug 86 p 3

[Editorial article]

[Abstract] The article presents a continuation of a report on the performance of the first aid amphibious cutter "Puma". Report of the air-pillow-boat's capability of crossing water and land masses stresses its medical application which exceeds that of air evacuation by helicopters, mainly by the potential of performing "on site" medical treatment procedures. The maximum speed of this cutter is 65 km/hr (70 km/hr on ice surface); it is propelled by a ZMZ-53 automobile engine. The cutter can be operated by one individual; up to three medical staff persons and 2-3 casualties can be accommodated. Weight capacity is 1.5 tons. Universal application of this amphibious cutter is praised. A photo is shown.

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CSO: 1840/1290

RADIATION BIOLOGY

RADIOPROTECTIVE EFFECT OF DIBUNOL

Moscow TASS in English 9 Jul 86

[Text] Dibunol, a preparation synthesized at the Chemical Physics Institute of the USSR Academy of Sciences reduces radiation effects on human organism by a third [sic]. As clinical research has shown, the preparation is also effective in treatment of cardiovascular and oncological diseases.

"Would you like to taste dibunol?" asks Professor Yelena Burlakova, offering a light-brown, soft capsule reminiscent of an acorn." Apart from preventing mutations in the cells of the body and apart from its anti-carcinogenic effects, it increases work capacity, improves eyesight and even increases life expectancy in a certain measure."

This bitterish [sic] capsule reminiscent in its taste of vegetable oil, contains bioantioxidants -- a new class of chemical compounds preventing the membrane of the living cell from unfavorable external effects, Professor Burlakova explained, since if the cell membrane is destroyed, the cell will die sooner or later.

Bioantioxidants prevent the development of the disease and localize it. They are harmless to human health, since they do not form toxins.

/12955

CSO: 1840/1305-E

## PROTECTION AGAINST RADIATION IN CHERNOBYL

Moscow ARGUMENTY I FAKTY in Russian No 21, 20-26 May 86 pp 3-4

[Report by V. Romanenko on interview with Prof V. Golikov, doctor of medical sciences, head of the Department of Radiation Hygiene at the Central Institute for Advanced Training of Physicians, by correspondent of ARGUMENTY I FAKTY: "Radiation and Safety"; date and place not specified]

[Text] We continue the publication of the talk with Prof V. Golikov, doctor of medical sciences, head of the Department of Radiation Hygiene of the Central Institute for Advanced Training of Physicians. (See the beginning in ARGUMENTY I FAKTY, No 20)

Correspondent: Vladimir Yakovlevich, what measures exist to protect the population against radiation?

Golikov: A radiation safety service headed by Academician P. Burgasov has been operating in the USSR for 30 years. Its task includes systematic control of the radioactivity of the environment and of the levels of irradiation of the population, of the personnel of radiological facilities, and of patients undergoing roentgenological and radioisotopic examinations. A large volume of knowledge of the biological effect of ionizing radiation has been accumulated. On its basis the Commission on Radiation Protection under the USSR Ministry of Health under the guidance of Academician L. Ilin prepared "Norms of Radiation Safety" and other enforceable enactments legislatively introduced throughout the territory of the Soviet Union. Their reliability has been confirmed by 3-year observations by specialists. These documents also clearly outline basic measures to protect the population against radiation in case of an emergency situation at a nuclear electric power station.

The discontinuation of the discharge of radioactive substances into the atmosphere and the creation of a shield from neutron-screening and -absorbing materials are the first and main tasks. Five thousand tons of sand, boron, clay, dolomite, and lead made it possible to "immure" the reactor roof.

The evacuation of the population from the region of increased radiation danger, which was carried out from the 3-km zone around the Chernobyl AES, is the second, no less important, problem.

Control of the use of safe products and water is the third. For this purpose a strict dosimetric control of milk, fish, and vegetables grown on open ground and "operation embankment," that is, creation of embankments along the banks of the Pripyat River for the elimination or reduction in the washout of part of the dangerous substances into it, are carried out in the increased radiation zone. A regular inspection of Kiev's reservoirs showed that the level of radioactivity was normal consistently. These are large-scale tasks. With respect to individual tasks, it is recommended that the population in the increased radiation focus remains within closed premises, does not open windows, and does not hang the laundry on the street. For example, the walls of a building inhibit the radiation from an area polluted with radioactive precipitation no less than 10-fold. If all windows and doors are closed, dangerous substances hardly penetrate the premises. It is necessary to carry out wet cleaning as often as possible and to avoid the accumulation of dust and it is not desirable to use open reservoirs for drinking.

When a radioactive contamination of the skin and clothes is detected by dosimetric instruments, as a rule, contaminated clothes are taken off so that radioactive substances are not transferred from them to the skin and the contaminated section of the skin is washed with warm running water and household soap and Astra, Novost, Era, and OP-7 detergents three or four times. An early hygienic treatment of contaminated skin sections removes up to 80 or 90 percent of the dangerous substances and the use of the Zashchita preparation results in the removal of up to 98 percent as compared with initial values.

With an increased content of iodine radioisotopes in the environment, an intake of preparations of potassium iodide reducing the amount of iodine-131 in the body more than 30-fold is recommended. A joint application of ATP, perchlorates, and imitetravit (complex of vitamins B, C, and P and amino acids) increases the antiradiation effect significantly.

A preventive treatment of the population with iodine was carried out in the entire zone considered dangerous. In other places there is no need to use medicinal substances and to take other medical measures.

I would like to especially stress that measures to protect the population against radiation (evacuation, therapeutic measures, and intake of drugs) should be implemented strictly according to the instructions of specialists and only in a high radiation zone. Unjustified measures can do much greater harm to people's health than ionizing radiation. In connection with this we consider the preventive treatment with iodine in some European countries unsubstantiated. Such allegedly increased concern for people, if the frequency of cases of idiosyncrasy (intolerance) to iodine is taken into consideration, can do great harm to the health of the population in these countries.

Correspondent: Power engineers and builders, eliminating the consequences of the accident at the Chernobyl AES, are performing special operations inside the block under conditions of high radioactivity. What is the degree of danger to them?

Golikov: A person can be subjected to the risk of the effect of unfavorable factors both in industry and in his daily life during any type of activity, or even complete inactivity, because the latter can also have a negative effect on his health. For example, extensive statistics convince us that the probability of death as a result of a radiation accident at a nuclear electric power station is 10,000-fold lower than during travel by car and 100-fold lower than the probability of death by a bolt of lightning. Our press informs the population of the situation at the Chernobyl AES in detail every day. According to international and internal Union safety norms, a person annually receiving 25 roentgens is kept away from work at nuclear stations for 12 months. Power engineers and builders eliminating the consequences of the accident received up to 12 roentgens during 2 weeks of work. Even those that solve problems in the very epicenter of events, where the danger is the greatest, do not receive radiation doses that would threaten their lives.

All the more so, because special filtering and insulating protective facilities are used during emergency operations in the radiation zone. For example, respiratory organs are protected by means of Lepestok-type respirators, which lower the dangerous dose in the inhaled air more than 99 percent.

Helicopter pilots working over the damaged nuclear reactor under complex conditions were supplied with respirators and special lead pads and the helicopter cabin was faced on the inside with lead sheets protecting against radiation. Largely owing to these people, the situation at the Chernobyl AES was stabilized.

The plastic suits in which the station personnel work ensure complete protection against ionizing radiation and, essentially, rule out skin contamination. People can even work in them in the so-called "radioactive section," where radiation doses exceed lethal doses manyfold.

Before every shift workers change their underwear, hats, socks, shoes, and gloves. All persons are supplied with individual dosimeters and work under their constant control. The work time is recorded strictly. Furthermore, automatic remote-control manipulators capable of performing a vast range of operations are used for repair and emergency operations in foci of radioactive contamination.

Correspondent: Vladimir Yakovlevich, what demands are placed on the organization of medical aid in a radiation danger zone?

Golikov: The actions of medical workers in an extreme situation can be demonstrated with a concrete example. Together with the workers of the nuclear station, firemen and militia workers from the first days of the Chernobyl disaster, physicians joined the fight for the elimination of the consequences of the accident. A total of 230 medical brigades were formed, new medical institutions were established, about 100 sanitary multispecialization centers were opened, and about 250,000 measurements were taken in 2 weeks. A total of 1,300 physicians, nurses, laboratory workers, and health physicists and 200 ambulances from Kiev and other cities were sent

to the station's region. Twelve medical brigades from other oblasts were sent to the village of Peskovka alone, where more than 2,000 people from the danger zone were quartered, to help local physicians. By 9 May one-half of the people sent to the hospital after the accident were discharged. All the people evacuated from the danger zone underwent medical examinations and thousands of blood analyses were taken. About 100,000 people have already been examined. I would like to stress once again that permanent control of people's health is the main goal of this enormous work.

Extensive sanitary-educational work is being carried out. For example, it was explained to Kiev's population that, according to preliminary calculations, the radiation background in Kiev would return to the norm somewhere by 19 May, even though from the moment of the accident through this day it did not present a threat to people's health.

If the presently existing situation remains even for 1 month (there is no doubt that it will improve), the radiation dose will amount to approximately 150 milliroentgens (with due regard for the natural background). Under normal conditions the dose limit for the population is 500 milliroentgens (in terms of annual irradiation for 70 years). For example, norms existing in the United States for workers at nuclear electric power stations stipulate that the radiation dose, to which they are subjected, should be no more than 3,000 milliroentgens during a 3-month period.

Of course, residents in Chernobylskiy Rayon are disturbed by the danger of increase in oncological diseases and genetic disorders as a result of the rise in the radiation level. There is no basis for anxiety. First, the onset of these diseases was really registered in man, as a rule, only under the effect of large radiation doses (more than 50 roentgens) and such levels were not observed at the station's area. Second, exposure to "heavy" nonvolatile isotopes, whose discharge was prevented at the moment of the accident, leads to an increased risk of development of oncological diseases and genetic disorders.

Third, even in the danger zone (in the absence of protective facilities) the thyroid gland, whose diseases are well diagnosed and treated, is primarily subjected to irradiation. The dose on gonads is below 500 milliroentgens, that is, below the dose permissible for the population.

Correspondent: What measures are effective when sections of the area contaminated with radioactive substances are cleaned?

Golikov: Of course, a reliable long-term isolation of the biosphere from increased radioactivity is an extremely important problem. Extensive work on cleaning the contaminated sections of the area of the nuclear electric power station, of the station itself, of buildings, and of the soil is being done now.

The cleaning of especially contaminated sections, that is, of the reactor and everything next to it, and deactivation of roads by means of ordinary detergents and sprinkling machines, of houses, and of technical facilities with the use of "radioactive dyes" made on the basis of epoxy resins and

immobilizing radioisotopes are the most important at the first stage. A new method of decontaminating soil, which is covered by a special deactivating film, was invented during the emergency situation. Up to 300,000 square meters of area are decontaminated in such a manner in 24 hours. After this radioactive dust and particles cannot get into the soil and water.

A method of pouring liquid glass for covering roofs of buildings and installations has been developed. The connection of the sewer drainage system has been completed. This fully rules out the entry of rain water from the station into the Pripyat River.

A "cushion" of liquid nitrogen is created to protect the ground under the reactor.

An encapsulation of the fourth safety block and subsequently its "burial" with an observance of strict safety measures are envisaged.

Despite the fact that today the radiation level at the station and the adjoining area still remains high, measures necessary to ensure the safety of all people and eliminate the consequences of the accident are being taken.

I believe that in the near future people will be able to return to this land and to continue normal life.

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UDC 577.391:591.781.1

EFFECTS OF IONIZING RADIATION ON GABA SYSTEM AND GABA-COUPLED REACTIONS IN BRAIN

Yerevan NEYROKHIKIYA in Russian No 3, Jul-Sep 84  
(manuscript received 3 Sep 82) pp 324-325

[Article by I. V. Savitskiy, V. A. Rozanov and V. V. Tsybulskiy, Medical Institute imeni N. I. Pirogov, Odessa]

[Abstract] The effects of ionizing radiation on the GABA system in the brain were studied on mice and rabbits, involving both head and whole body irradiation. In both cases and both species essentially equivalent results were obtained, demonstrating that head (4.5 Gy) and whole body (15 Gy) irradiation led to inhibition of the GABA shunt pathway in the brain and spinal cord. As a result, brain levels of GABA and alpha-ketoglutarate showed an increase, while glutamate levels were depressed. These observations were interpreted to indicate an imbalance between stimulatory and inhibitory neurotransmitters, a fact that may be used in explaining functional changes in the CNS induced by ionizing radiation. Figures 3; references 18; complete text deposited with VINITI (All-Union Institute of Scientific and Technical Information).

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EFFECTS OF SUPRALETHAL DOSES OF GAMMA-RADIATION ON CHOLESTEROL SYNTHESIS IN  
RAT LIVER

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 288, No 3, May 86  
(manuscript received 12 Dec 85) pp 744-747

[Article by L. N. Markevich, Yu. S. Kaznacheyev, I. K. Kolomiytseva and  
A. M. Kuzin, corresponding member, USSR Academy of Sciences, Institute of  
Biological Physics, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] Wistar rats were employed in a study designed to further define the role of lipogenesis in animal survival following high-dose gamma-irradiation. Studies on the hepatic concentration of free cholesterol, cholesterol esters, and the rate of C-14-acetate incorporation into cholesterol and total lipids demonstrated that gamma-irradiation in doses of 25 to 200 Gy from a Co-60 source (3 Gy/min) enhanced lipogenesis. In the 200-270 Gy range enhancement was less pronounced. Comparison of survival curves with the cholesterol/total lipids ratio for the incorporation of C-14-acetate revealed parallel plateau runs in the 25 to 200 Gy range, followed by a gradual downward change in the 200-300 Gy range. Thus, a definite correlation was demonstrated between the efficiency of enhanced cholesterol synthesis and survival, underscoring the significance of lipogenesis as a mechanism important in radioresistance. Figures 3; references 14: 4 Russian, 10 Western.

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## IMMUNE FACTORS IN ANIMALS

Omsk ZEMLYA SIBIRSKAYA DALNEVOSTOCHNAYA in Russian No 5, May 86 pp 48-49

[Article by Yu. P. Kopyev, physician)

[Abstract] A series of experiments on dogs hypersensitized to equine serum demonstrated three distinct stages in the pathogenesis of anaphylaxis. The initial stage, on administration of either the sensitizing antibody or the antigen, resulted in short-term manifestation of inflammation, taking the form of leucocytosis and enhanced neutrophil activity. Subsequent onset of sensitization was characterized by latent evidence of an anaphylactic process in the form of leukopenia, neutropenia and lymphocytosis. Finally, frank anaphylaxis was induced in naive dogs by injection of antigen-antibody complexes. The delineation of different stages in the anaphylactic process may be of diagnostic use in the evaluation of this type of immune pathology and, perhaps, in devising therapeutic approaches.

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## UPDATING VETERINARY SERVICES

Moscow SELSKAYA ZHIZN in Russian 3 Aug 86 p 2

[Article by A. Belov, rector, Moscow Veterinary Academy, and corresponding member, All-Union Agricultural Academy imeni Lenin (AUAAL), and V. Skorin, academician, AUAAL]

[Abstract] A current problem on a nation-wide scale pertains to the loss of heifers from a variety of diseases, and the consequent dairy product losses that are felt by everyone. However, many veterinary institutes and research establishments are primarily concerned with improving salaries, rather than concentrating on research efforts that would alleviate the problem. In addition, at many institutions, (such as the Daghestan Scientific Research Veterinary Institute headed by N. Kh. Mamayev), there are simply no qualified veterinary personnel to address the problem of the heifers. At the North Caucasian Zonal Scientific Research Veterinary Institute the emphasis for 20 years has been on porcine and equine chlamydiosis, with other areas suffering from virtually total neglect. What is required is greater sensitivity to current needs and timely reorientation of research endeavors. In addition, utmost efforts must be made to upgrade diagnostic capabilities, and training programs must be updated to produce specialists capable of coping with new challenges.

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CONFERENCES

FIRST CONGRESS OF PSYCHIATRISTS FROM SOCIALIST COUNTRIES

Alma-Ata ZDRAVOOKHRANENIYE KAZAKHSTANA in Russian No 4, Apr 86, pp 21-23

[Article by R.G. Ilesheva, Head, Department of Psychiatry, Alma-Ata Medical Institute]

[Text] On 25 - 27 September 1985 the first Congress of Psychiatrists from Socialist Countries was held in Moscow. Participants included representatives from the Soviet Union, Hungary, Mongolia, Poland, Czechoslovakia, and Yugoslavia. A broad range of urgent problems in psychiatry and drug abuse were discussed at this conference.

The first plenary session was devoted to general and administrative issues. In the opening address, G.V. Morozov, chairman of the All-Union Society of Neuropathologists and Psychiatrists and academician of the USSR Academy of Medical Sciences, noted that there exist close scientific contacts between the leading Soviet scientific research institutes and departments of psychiatry and the scientific research institutions and university clinics in the other socialist countries. Intensive cooperative (inter-institute) research is being conducted to identify the biological foundations of psychiatric illnesses and alcoholism, and to study their course, as well as on questions of therapy and rehabilitation. Results of this research were reported at international symposia in Baku and Kiev. Monographs and recommendations have been published. Future plans call for the establishment of centers to train young specialists, and the publication of a psychiatric journal of the socialist countries. The speaker stated that in the Soviet Union an All-Union Center on the Problems of Alcoholism has been opened with the principal mission of preventing this disease.

The problems of multifaceted international cooperation was the subject of papers by Soviet scientists, A.V. Snezhnevskiy, M.Ye. Vartanyan, R.A. Nadzharov, N.M. Zharnikov, and also by scientists of the other socialist countries, namely, Ya. Mechirzha, Ya. Gebkhard (CSSR), Z.B. Nikel (GDR), and V. Milev (Bulgaria). These papers noted the productivity of joint research on issues of psychopharmacology, rehabilitation, epidemiology of psychiatric diseases, and also various aspects of alcoholism. The help of Soviet institutions in the training of personnel and provision of scientific leadership for joint research was highly appreciated. A desire was expressed to increase collaboration among psychiatrists of socialist countries. In

connection with this, it was proposed that an association of psychiatrists from socialist countries be established. This proposal was supported in the discussion by professors V.V. Kovalev and M.M. Kabanov.

The second plenary session was completely devoted to the future of scientific research in drug abuse, new methods of treatment, prevention and early diagnosis of alcoholism.

I.P. Anokhina, corresponding member of the USSR Academy of Medical Sciences, noted in a paper entitled "Regulation of the functioning of the dopamine system as the basis for the development of new methods of preventing and treating alcoholism," that accumulation of dopamines in the blood and brain plays an important role in alcoholism, since it determines the severity of withdrawal from alcohol and the likelihood of alcoholic psychosis (delirium) occurring and is the major reason for relapses. Individual differences in the development of alcoholism are determined by differences in dopamine levels, which, in turn, are a function of enzyme activity. When enzyme activity is low, an excess of dopamine develops rapidly. Because of this children born of alcoholic parents have a high risk of developing the disease.

One of the substances which lowers dopamine levels is apomorphine, but it, unfortunately, is rapidly excreted by the body.

Neuroleptic agents, such as substance P, and cholecystokinin, act on the dopamine system, to decrease withdrawal symptoms, and lower the desire for alcohol. Cholecystokinin has begun to be used in clinical practice. Even a single administration immediately decreases the level of dopamine in the blood, an effect which persists for a long period, and has a therapeutic effect which currently has no rival.

Ya. Mechirzh and I. Marechek (CSSR) shared their experience in setting up a 13-week course on alcoholism for alcoholics, which was followed by an examination and family therapy.

Ya. Silard (Hungary), whose paper concerned the analysis of cases of suicide in alcoholics, noted their frequency, which he associated with alcoholic depression and break-up of marriages. He emphasized the need to normalize interpersonal relationships and restore disrupted communicativeness in alcoholics.

Professor A.A. Ivanets (with co-authors M.I. Lukomskaya, and Ye.S. Menshikova) reported on a new approach to the problem of early diagnosis of alcoholism. They introduced the delegates to a methodology for diagnosing so-called problem drinking where there is moderate use of alcohol and alcoholism has not yet developed. The identification of people with these characteristics make it possible to forestall the subsequent development of alcoholism.

Sessions were devoted to discussion of the topics of: preventing psychiatric illnesses, and therapy and rehabilitation of the mentally ill; the epidemiology of psychiatric illnesses; problems of forensic psychiatry; the biological foundations of psychiatric illnesses; and others.

Professor A.S. Tiganov presented a paper on "Modern problems in symptomology, pathokinesia, and nosology"; Professor G.Ya. Abrutskiy gave one on "Urgent problems in modern therapy for psychosis;" and Professor Yu. M. Saarm spoke "On the combined use of insulin and electric shock in psychopharmacology."

A scientist from GDR, G.Ye. Kyune devoted his presentation to the use of anticonvulsants for treating affective and other psychoses. He noted the efficacy of finlepsin which has no side effects.

Ye. Stoymenov (Bulgaria) described the use of computer-aided tomography for studying the brains of schizophrenics to identify organic changes, the nature of which is still not clear. Kh. Khristozov (Bulgaria), in a paper entitled "Automated nosometry in psychiatry," spoke of the need to utilize mathematical modeling in psychiatry.

Organizational issues in psychiatry and drug abuse were the subjects of papers by M.Kh. Gonopolskiy (Alma-Ata), A. Yanik (CSSR), and others.

The concluding address was delivered by A.A. Churkin, the chief psychiatrist of the USSR Ministry of Health, who called the attention of the delegates at the congress to organizational aspects of out-patient therapy for the mentally ill, demonstrated the advantages of out-patient therapy, and noted the characteristics of treatment in rural areas.

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MISCELLANEOUS

RESEARCH ON EXTRASENSORY PERCEPTION

Moscow IZVESTIYA in Russian 3 Jul 86 p 6

[Article by B. Konovalov, scientific observer of IZVESTIYA: "Extrasense Through the Eyes of Physics"]

[Text] True science shuns any mysticism and sensation which smell of adventurism. Science firmly believes, using the words of the great Russian mathematician N. I. Lobachevskiy, that "... everything in nature is subject to measurement, everything can be counted." True, it should be noted that, when it encounters various "miracles" and sensational mysteries, it does not always try to embark on measurements. The reason is simple: The very involvement in a "tainted" subject can undermine a scientist's solid reputation in the world of his colleagues.

For more than a year extrasenses have served as the subject of gossip, of ecstasy by some and condemnation by others for various attempts at healing, and of speculations in the abilities of extrasensory perception. For a long time the atmosphere of unhealthy sensationalism has scared away serious researchers and prevented them from embarking on the study of unusual properties of the human organism. Now the situation is beginning to change.

The "ice began to break" almost simultaneously in Leningrad and Moscow. A coincidence brought together Prof G. N. Dulnev, rector of the Leningrad Institute of Precision Mechanics and Optics of the USSR Ministry of Higher and Secondary Specialized Education, and N. S. Kulagina, who possesses unusual abilities. Beginning in the 1960's Ninel Sergeyevna often demonstrated her amazing abilities before the public. Various authorities recorded the "phenomenon," but the matter did not go further. A group of scientists headed by G. N. Dulnev decided to cast aside any mysticism and the profound explanations of the observed effects by a certain magic biofield allegedly characteristic only of the "chosen" and to attempt to clarify the truth.

They set for themselves the task of investigating whether some real physical fields, which could be measured by laboratory instruments, appeared during the experiments with Kulagina. Ninel Sergeyevna voluntarily and, I stress, disinterestedly, participated in the experiments.

"It is important to me," Kulagina said, "that, while I am alive, you try to understand what is the secret of my abilities. Perhaps this will prove to be important for all people."

The research was conducted in 1977-1978 quite slowly, because, first, it was a sideline for scientists and, second, greatly depended on how Kulagina felt. She is an elderly person. She participated in the Great Patriotic War--was a radio operator in the tank corps and was wounded seriously. All the experiments were very difficult for her. It seemed to scientists that during the experiments she experienced the same tension felt by a sportsman during a weight jerk. A physician was present without fail at every session in order to keep an eye on her condition. Her upper arterial pressure reached 180 to 200 mm of the mercury column. Analyses showed that the blood formula changed greatly--the amount of sugar was lowered. For her every session was difficult work.

As a result, Leningrad scientists were able to establish that Kulagina creates an effect on weights at a distance, including through a glass obstacle, scatters the laser irradiation of certain wavelengths, and generates magnetic field pulses.

At the beginning of 1978 a group of Moscow scientists headed by academician Yu. B. Kobzarev investigated Kulagina's unusual abilities. There Yu. V. Gulyayev (now academician) discovered by means of sensors acoustic pulses--clicks--periodically emanating from Kulagina, which lasted only hundredths to tenths of a second.

A study of extrasenses of the type of the famous Dzhuma--Yevgeniya Yuvashewna Davitashvili--whose abilities differ from the "Kulagina phenomenon," was conducted in greater detail in Moscow. Davitashvili willingly cooperated with a group of physicists at the Institute of Radio Engineering and Electronics (IRE) of the USSR Academy of Sciences headed by Yu. V. Gulyayev and readily demonstrated her abilities in experiments utilizing a modern arsenal of research equipment.

The institute has long and successfully utilized radioelectronic methods of obtaining information on remote objects according to their own irradiation. This is called passive remote sounding. For example, soil moisture is investigated by such methods on board the aircraft. In essence, we are indebted to this research method for the lion's share of our knowledge of the universe. Basically, we judge the state of celestial bodies from electromagnetic radiation reaching the earth's surface or satellite instruments.

If information on the state of planets, stars, and galaxies is coded in their radiation, in exactly the same way it exists in radiation emanating from live objects. This has become the basic research idea at the IRE.

In principle, the possibility of a remote reception of information on man by means of ordinary sensory organs--those of vision and hearing--has been long and widely utilized for diagnosis. On the other hand, man's sensory organs are also utilized for a therapeutic effect; for example, in widely known

psychotherapy. This evokes no one's surprise. The possibility of the sensitivity, in addition to ordinary sensory organs, of one person to physical fields generated by others was examined in the problem of extrasenses. Such a possibility is denied by many, although, in fact, this is an extremely interesting and scientifically fully substantiated interaction channel.

Whereas until now all research of this kind was the "hobby" of certain scientists, now a laboratory of radioelectronic methods of investigation of biological objects has been organized especially. It is engaged in this matter professionally. Doctor of Physicomathematical Sciences E. E. Godik, a specialist in the field of techniques of detection of infrared radiation, heads it.

Moscow scientists selected all the physical fields which can carry physiological information. They are electric and magnetic fields, infrared, radiothermal, optic, and acoustic radiations, and changes in the chemical composition of the environment connected with vital activity. They are investigated by means of highly sensitive sensors and modern systems of information recording and processing.

A comparative study of the physical fields of a control group (laboratory workers) and of a group of extrasenses, primarily Ye. Yu. Davitashvili, was made by means of the developed sensitive equipment.

When extrasenses switched over to the "working regime," the following changes in their physical fields near their wrists were recorded: a characteristic change in infrared thermal radiation, a rise in the intensity of a very weak optic luminescence, an increase in the magnetic field, and an occurrence of low-frequency electric field oscillations.

In the opinion of physicists, the detection of the very high sensitivity of our skin to heat flows, including those emanating from another person, was especially important. It turned out that the human hand could "note" at a distance of several centimeters an increment in the infrared heat flow corresponding to a rise of several tenths of a degree in the body temperature of another person.

Extrasenses are noted for an even higher sensitivity. Since the hand serves both as the detector and source of heat flows, the phenomenon of a warming of several degrees in the patient's skin under the effect of an extrasense observed by means of an instrument can be understood.

It turns out that the patient's skin warms up unevenly--areas with a disturbed heat regulation warm up more. At the same time, as direct measurements by means of a depth radiothermometer have shown, the temperature of the internal organ, whose projection on the skin is subject to the effect, can also rise. Owing to its sensitivity to the change in the heat flow, the hand "notes" this reaction of the organism and the extrasense can concentrate his efforts on such places. Such a mechanism of effect is called feedback in science.

The hand of the extrasense in the "working regime" warms up by several degrees. Furthermore, the heat flow also changes during a hand movement.

Thus, a distinctive contactless massage with infrared--invisible to the eye--thermal radiation by a moving hand is fully possible.

A study of the physiological and, especially, medical aspect of this phenomenon is the concern of physiologists and physicians. For physicists it was important to demonstrate the existence of a special sensory channel, through which it is possible to obtain physiological information and a remote effect. They conducted an experiment which definitively convinced scientists that ordinary sensory organs had nothing to do with this. When a glass wall nontransparent for infrared radiation was placed between the patient and the hand of the extrasense, the patient's skin did not warm up, although the ordinary sensory contact was not disturbed in the process.

A number of experiments with N. S. Kulagina were also conducted at the Moscow laboratory. It was established that in an ordinary state the characteristics of physical fields in N. S. Kulagina, as well as in Ye. Yu. Davitashvili, did not differ from the signals of the control group. When she switched over to the "working regime," a significant--approximately a thousand-fold--intensification of the brightness of the optic luminescence of fingers, a sharp pulse increase in the conductivity of the medium near the hands accompanied by acoustic clicks, and low-frequency electric signals were noted. Thus, in this case as well, correctly placed "nets" of a modern physical experiment gave an appreciable "catch."

The mechanism of the "Kulagina phenomenon" is more complex than that of ordinary extrasenses and as yet not everyone agrees with the explanation suggested by specialists at the IRE laboratory. However, the chief thing is clear--there is no mysticism. There is a real physical effect recorded by instruments.

Unfortunately, two extreme points of view of the problem of extrasenses still predominate and are reflected in the press. Some believe that here we deal with adroit stunting, or a purely psychological suggestion, and that this is "pseudoscience," in which it is shameful for an intelligent person of the 20th century to engage. Conversely, others maintain that everything is clear and obvious--there is a new method of treating people--but the conservatives that sit in the Ministry of Health and in the USSR Academy of Medical Sciences "suppress" the new direction as they once "stifled" cybernetics and genetics. Both of these extreme points of view are harmful, because both assert that everything is clear to science (each implies this in its meaning). In fact, this is not so--only the first steps have been taken. In order to go further, it is now necessary to organize a closer interaction of physicists with physiologists, physicians, psychologists, and specialists in other fields of knowledge of man.

It is time to understand that the talks about mysticism, quackery, and the notorious biofield, which occur even at general meetings of the USSR Academy of Sciences, only hamper a constructive approach to the problem, whose solution will help to obtain fundamentally new knowledge of man, which will be of great practical value.

On the other hand, it is time for the USSR Ministry of Health to finally abandon the position of a scornful attitude toward extrasenses. After all, talks have been going on for decades, but to this day the USSR Ministry of Health has not conducted a state clinical check which would give a clear answer: Do extrasenses have a therapeutic effect on patients or not?

After all, the long-term disregard for the problem really creates an excellent basis for "underground treatment" and for the flourishing of all kinds of quacks getting rich on human misfortune. At the same time, this activates dark religious forces, which try to explain the abilities of extrasenses by a miracle and by "God's Grace" granted to the chosen.

The outstanding philosopher-mathematician Francis Bacon once predicted optimistically: "...All secrets and miracles will come to light, because their natural causes will be grasped." For this one thing is needed--to work and to continue research.

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ELECTRON-INDUCTION INSTRUMENT FOR MEASUREMENT OF AEROSOL DISPERSION

Moscow GIGIYENA I SANITARIYA in Russian No 12, Dec 85  
(manuscript received 5 Mar 85) pp 49-51

[Article by O. P. Misnikov, V. I. Moskalenko, A. I. Shevchenko, B. Yu. Koltsov, V. I. Turubarov and V. V. Rumyantsev, Military-Medical Academy imeni S. M. Kirov, Leningrad]

[Abstract] The electric induction method is considered to be a promising method for timely analysis of the disperse composition of an aerosol. The method has been implemented in the IRKA-1 electronic induction apparatus, which allows continuous monitoring and regulation of concentration, as well as periodic analysis of the disperse composition of aerosols. The operating principle is as follows: The aerosol to be studied is passed at a constant speed through a measurement line including an impulse corona charging chamber, electric separator and induction measurement chamber. Each aerosol particle passing through the charging chamber during a corona discharge pulse receives a charge proportional to the square of its radius. At the output of the charging chamber, the flux is modulated in terms of electric charge density of the particles, allowing the charge to be measured subsequently by a non-contact induction method. The apparatus can produce information on the dispersion of aerosols in less than one minute, recording results on a strip-chart recorder. One advantage of the apparatus is the broad range of concentrations which can be measured, from 0.01 to 700 mg/m<sup>3</sup>. Figures 2; references 3 (Russian).

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**Healing Effect of Non-Contact Massage**

Moscow MOSKOVSKAYA PRAVDA in Russian 22 Jun 86 p 2

[Article by L. Kolodnyy: "Obvious? Incredible"]

[Abstract] A case is made for the so-called "Dzhuma" effect, a non-contact massage which, although studied for the last 3-4 years, failed to penetrate the "blindness and deafness" of scientific leadership of the USSR Academy of Sciences. The healing effect is apparently due to thermal radiation generated by the operator's hands, which create special bio-fields. Reference is made to the non-scientific publication on the Dzhuma method and anecdotal cases, citing them as proof that this non-proven method was not accepted by higher administrative authorities.

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